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Tampere University
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RESEARCH EXPERIENCE

Tampere University, Tampere, Finland
- Marie Skłodowska-Curie Postdoctoral Fellow (2023-2026). Faculty of Education and Culture. *Advisor*: Kristian Kiili, Ph.D.; *co-Advisor*: Manuel Ninaus, Ph.D. (University of Graz, Austria); *industry-partner*: Psyon Games (Finland)

University of Pennsylvania, Philadelphia, PA, USA
- Postdoctoral Research Fellow (2022-2023). Penn Center for Learning Analytics. *Advisor:* Ryan S. Baker, Ph.D.

Soar Technology, Inc. (SoarTech), Orlando, FL, USA
- Research Associate III (2021-2022) in the Learning Technologies and Human Systems Division.

University of Central Florida, Orlando, FL, USA
- Graduate Research Assistant (2018-2021). Department of Learning Sciences and Educational Research, Laboratory of the Study of Metacognition and Advanced Learning Technologies. *Advisor*: Roger Azevedo, Ph.D.

U.S. Air Force Research Laboratory (AFRL), Dayton, OH, USA
- Repperger Research Intern (2021). 711th Human Performance Wing, Core Research Area: Personalized Learning & Readiness Sciences. *Supervisor:* Jennifer Winner.

North Carolina State University, Raleigh, NC, USA
- Graduate Research Assistant (2017-2018). Department of Psychology. Laboratory of the Study of Metacognition and Advanced Learning Technologies. *Advisor*: Roger Azevedo, Ph.D.

Virginia Commonwealth University, School of Medicine, Richmond, VA, USA
- Research Manager and Coordinator (2016-2017). Office of Assessment and Evaluation Studies; Center for Human Simulation and Patient Safety. *Supervisor*: Paul Mazmanian, Ph.D.

Christopher Newport University, Newport News, VA, USA
- Undergraduate Senior Research Assistant (2015-2016); Department of Psychology; Developmental Cognitive Neuroscience Laboratory. *Advisor:* Leslie Rollins, Ph.D.
- Summer Scholar Research Internship (2015); Department of Psychology; Developmental Cognitive Neuroscience Laboratory. *Advisor*: Leslie Rollins, Ph.D.

EDUCATION

2021   Ph.D.   University of Central Florida, Education and Learning Sciences
     Advisor: Roger Azevedo, Ph.D.
     Dissertation: Leveraging multimodal learning analytics to understand how humans learn with emerging technologies

2020   M.A.   University of Central Florida, Instructional Design and Educational Technology

Advisor: Roger Azevedo, Ph.D.

2016   B.S.   Christopher Newport University, Psychology major, Biology minor
        Advisor: Leslie Rollins, Ph.D.

PUBLICATIONS

Peer-reviewed Journal Articles

Cloude, **E. B.,** Dever, D. A., Hahs-Vaughn, D. L., Emerson, A. J., Azevedo, R., & Lester, J. (2022). Affective dynamics and cognition during game-based learning. *IEEE Transactions on Affective Computing*, 1-14. https://doi.org/10.1109/TAFFC.2022.3210755
- **Impact Factor: 13.99**

Cloude, **E. B.,** Azevedo, R., Winne, P. H., Biswas, G., & Jang, E. E. (2022). System design for using multimodal trace data in modeling self-regulated learning. *Frontiers in Education***,** 7, 928632.
- **Impact Factor: 2.32**

Azevedo, R., Bouchet, F., Duffy, M., Harley, J., Taub, M., Trevors, G., **Cloude**, **E. B.,** Dever, D. A., Wiedbusch, M. D., Wortha, F., & Cerezo, R. (2022). Lessons learned and future directions of MetaTutor: Leveraging multichannel data to scaffold self-regulated learning with an intelligent tutoring system. *Frontiers in Psychology*.
- **Impact Factor: 2.99**

Dever, D. A., Amon, M. J., Vrzakova, H., Wiedbusch, M. D., **Cloude**, **E. B.,** & Azevedo, R. (2022). Capturing Sequences of learners' self-regulatory interactions with instructional material during game-based learning using auto-recurrence quantification analysis. *Frontiers in Psychology*.
- **Impact Factor: 2.99**

Cloude, E. B., Carpenter, D., Dever, D. A., Lester, J., & Azevedo, R. (2021). Game-based learning analytics for supporting adolescents' reflection. *Journal of Learning Analytics*, *8*(2), 51-71.
- **Impact Factor: 4.69**

Dever, D. A., Wiedbusch, M., **Cloude, E. B.,** Lester, J., & Azevedo, R. (2021). Emotions and the Comprehension of Single versus Multiple Texts during Game-based Learning. *Discourse Processes*, 1-22.
- **Impact Factor: 2.074**

Taub, M., Azevedo, R., Rajendran, R., **Cloude, E. B.,** Biswas, G., & Price, M. J. (2021). How are students' emotions related to the accuracy of their use of cognitive and metacognitive processes during learning with a hypermedia-based intelligent tutoring system? *Learning and Instruction*, *72*, 101200.
- **Impact Factor: 6.**

Cloude, E. B., Dever, D. A., Wiedbusch, M. D., & Azevedo, R. (2020). Quantifying scientific thinking using multimodal data with Crystal Island: Implications for individualized game-learning analytics. *Frontiers in Education*, *5*, 572546. https://doi.org/10.3389/feduc.2020.572546
- **Impact Factor: 2.32**

Dever, D. A., Azevedo, R., **Cloude, E. B.,** & Wiedbusch, M. (2020). The impact of autonomy and types of informational text presentations in game-based environments on learning: Converging multi-channel processes data and learning outcomes. *International Journal of Artificial Intelligence in Education*, *30*(4), 581-615.

- **Impact Factor: 4.325**

Emerson, A., **Cloude, E. B.,** Lester, J., & Azevedo, R. (2020). Multimodal learning analytics for game-based learning. ***British Journal of Educational Technology***, *51*(5), 1505-1526.

- **Impact Factor: 5.268**

Rollins, L., & **Cloude, E. B.** (2018). Development of mnemonic discrimination during childhood. ***Learning & Memory***, *25*, 294-297.

- **Impact Factor: 4.057**

Rollins, L., Gibbons, J. A., & **Cloude, E. B.** (2018). Affective change greater for unpleasant than pleasant events in autobiographical memory of children and adults: A retrospective study. ***Cognitive Development***, *47*, 46-52.

- **Impact Factor: 1.865**

Book Chapters

Cloude, E. B., Wiedbusch, M. D., Dever, D. A., Dario Torre, D., & Azevedo, R. (2022). The role of metacognition and self-regulation on clinical reasoning: Leveraging multimodal learninganalytics to transform medical education. In M. Giannakos, D. Spikol, D. Di Mitri, K. Sharma, X. Ochoa, & R. Hammad (Eds.), ***The Multimodal Learning Analytics Handbook*** (pp. 105-129). Springer.

Dever, D. A., **Cloude, E. B.,** Wiedbusch, W. D., & Azevedo, R. (in press). Emotion theory and learning analytics: From theory, methods, and analyses to scaffolding emotion regulation. In K. Bartimote, S. K. Howard, & D. Gasevic (Eds.), ***Theory Informing and Arising from Learning Analytics***. Springer.

Gabriel, F., **Cloude, E. B.,** & Azevedo, R. (2022). Using learning analytics to measure motivational and affective processes during self-regulated learning with advanced learning technologies. In Y. Wang, S. Joksimović, M.O.Z. San Pedro, J.D. Way, & J. Whitmer (Eds.), ***Social and Emotional Learning and Complex Skills Assessment. Advances in Analytics for Learning and Teaching*** (pp. 93-108). Springer.

Dissertation

Cloude, E. (2021). Leveraging multimodal learning analytics to understand how humans learn with emerging technologies. *Electronic Theses and Dissertations*, 839. https://stars.library.ucf.edu/etd2020/839

Peer-reviewed Conference Proceedings ([#]=Undergraduate)

Cloude, E. B., Zhang, J., Baker, R. S., & Fouh, E. (in press). Procrastination vs. Active Delay: How Students Prepare to Code in Introductory Programming. In proceedings of **SIGCSE'24**: *The Technical Symposium on Computer Science Education*. Association for Computing Machinery.

Cloude, E. B., Baker, R. S., & Pankiewicz, M. (in press). Measuring Self-regulated Learning Processes in Computer Science Education. In Proceedings of **ICCE'23**: *The 31sth International Conference on Computers in Education*. Asia-Pacific Society for Computers in Education (APSCE).

Andres, J. M. Alexandra, **Cloude, E. B.,** Baker, R. S., & Lee, S. (in press). Investigating Cognitive Biases in Self-Explanation Behaviors during Game-based Learning about Mathematics. In Proceedings of **ICCE'23**: *The 31sth International Conference on Computers in Education*. Asia-Pacific Society for Computers in Education (APSCE).

Cloude, E. B., Baker, R. S., & Fouh, E. (2023). Online help-seeking occurring in multiple computer-mediated conversations affects grades in an introductory programming course. In Proceedings of **LAK'23**: *13th International Learning Analytics and Knowledge Conference* (pp. 378–387). Society of Learning Analytics.
- **Acceptance rate: 32%**

Kiili, K., Juho, S., **Cloude, E.,** & Dindar, M. (2022). Motivation and emotions in a health literacy game: Insights from co-occurrence network analysis. In K. Kiili, K. Antti, F. de Rosa, M. Dindar, M. Kickmeier-Rust, & F. Bellotti, (Eds.), Proceedings of **GALA'22**: *11th International Conference on Games and Learning Alliance, Lecture Notes in Computer Science* (vol. 13647, pp. 149–159). Springer. https://doi.org/10.1007/978-3-031-22124-8_15
- **Best Paper Nomination**

Dever, D. A., Amon, M. J., Wiedbusch, M. D., **Cloude, E. B.,** Azevedo, R. (2022). Analyzing information-gathering behavioral sequences during game-based learning using auto-recurrence quantification analysis. In P. Zaphiris & A. Ioannou (Eds.), **HCII' 22**: *Proceedings of Learning and Collaboration Technologies. Designing the Learner and Teacher Experience from Lecture Notes in Computer Science* (pp. 60-71), vol 13328. Springer.

Cloude, E. B., Wortha, F., Dever, D. A., & Azevedo, R. (2021). Negative emotional dynamics shape cognition and performance with MetaTutor: Toward building affect-aware systems. In (Eds.), **ACII'21**: *Proceedings of the 9th International Conference on Affective Computing & Intelligent Interaction*. IEEE.

Carpenter, D., **Cloude, E. B.,** Rowe, J., Azevedo, R., & Lester, J. (2021). Investigating student reflection during game-based learning in middle grades science. In M. Scheffel, N. Dowell, S, Joksimovic, & G. Siemens (Eds.), **LAK'21**: *Proceedings of the 11th International Learning Analytics & Knowledge Conference* (pp. 280-291). ACM.

Cloude, E. B., #Ballelos, N. A. M., Azevedo, R., Castiglioni, A., LaRochelle, J., Andrews, A., & Hernandez, C. (2021). Designing intelligent systems to support medical diagnostic reasoning using process data. In I. Roll, D. McNamara, S. Sosnovsky, R. Luckin, V. & Dimitrova (Eds.), **AIED'21**: *Proceedings from the 22nd International Conference on Artificial Intelligence in Education Lecture Notes in Computer Science* (vol 12749, pp. 109-113). Springer.

Cloude, E. B., Wortha, F., Wiedbusch, M., & Azevedo, R. (2021). Goals matter: Changes in metacognitive judgments and their relation to motivation and learning with an intelligent tutoring system. In P. Zaphiris & A. Ioannou (Eds.), **HCII'21**: *Proceedings of Learning and Collaboration Technologies: New Challenges and Learning Experiences in International Conference on Human-Computer Interaction Lecture Notes in Computer Science* (vol 12784, pp. 224-238). Springer.

Dever, D. A., **Cloude, E. B.,** & Azevedo R. (2021). Examining learners' reflections over time during game-based learning. In I. Roll, D. McNamara, S. Sosnovsky, R. Luckin, & V. Dimitrova (Eds,), **AIED'21**: *Proceedings from the 22nd International Conference on Artificial Intelligence in Education Lecture Notes in Computer Science* (vol 12749, pp. 129-133). Springer.

Wiedbusch, M. D., Dever, D. A., Wortha, F., **Cloude, E. B.,** & Azevedo, R. (2021). Revealing data feature differences between system- and learner-initiated self-regulated learning processes within hypermedia through principal component analysis. In R. A. Sottilare & J. Schwarz (Eds.), **HCII'21**: *Proceedings from the Adaptive Instructional Systems. Design and Evaluation, Lecture Notes in Computer Science* (vol 12792, pp. 481-495). Springer.

Cloude, E. B., Wortha, F., Dever, D., & Azevedo, R. (2020). How do emotions change during learning with an intelligent tutoring system? Metacognitive monitoring and performance with MetaTutor. In S. Denison., M. Mack, Y. Xu, & B.C. Armstrong (Eds.), **CogSci'20***: Proceedings of the 42nd Annual Conference of the Cognitive Science Society* (pp. 423-429). Cognitive Science Society.

Dever, D. A., **Cloude**, **E. B.**, & Azevedo, R. (2020). Does prior knowledge influence learners' cognitive and metacognitive strategies over time during game-based learning? In S. Denison., M. Mack, Y. Xu, & B.C. Armstrong (Eds.), **CogSci'20**: *Proceedings of the 42nd Annual Conference of the Cognitive Science Society* (p. 2146). Cognitive Science Society.

Cloude, E. B., Taub, M., Lester, J., & Azevedo. R. (2019). The role of achievement goal orientation on metacognitive process use in game-based learning. In S. Isotani, E. Millán, A. Ogan, P. Hastings, B. McLaren, & R. Luckin (Eds.), **AIED'19**: *Proceedings of the 20th International Conference on Artificial Intelligence in Education (AIED 2019)* (pp. 36-40). Amsterdam, The Netherlands: Springer.

Cloude, E. B., Taub, M., & Azevedo, R. (2018). Investigating the role of goal orientation: Metacognitive and cognitive strategy use and learning with intelligent tutoring systems. In R. Nkambou, R. Azevedo, & J. Vassileva (Eds.), **ITS'18**: *Proceedings of the 14th International Conference on Intelligent Tutoring Systems (ITS 2018)* (pp. 44-53). Amsterdam, The Netherlands: Springer.

Peer-reviewed Companion Workshop Proceedings

Cloude, E. B., Baker, R. S., Mills, C., Kovanovic, V., & Gasevic, D. (2023). AffectLA: Situating Affect in Learning Analytics, Addressing Educational Challenges. **LAK'23**: *Companion proceedings of the 13th International Learning Analytics & Knowledge Conference* (pp. 300-303). Society for Learning Analytics Research.

Cloude, E. B., & Azevedo, R. (2020). Contextualizing multimodal learning analytics to theoretical frameworks and learning environments. In Kovanović, V., Scheffel, M., Pinkwart, N., & Verbert, K. (Eds.), **LAK'20**: *Companion proceedings of integrating multi-channel learning to model complex learning processes workshop @ LAK'20. 10th International Learning Analytics & Knowledge Conference (LAK)*. Alberta, Canada: Society for Learning Analytics Research.

UNDER REVIEW

Cloude, E. B., [#]Kumar, P., Baker, R. S., & Fouh. E. (under review). The International Learning Analytics and Knowledge Conference (LAK).

Cloude, E. B., Baker, R. S., & Fouh, E. (under review). The International Learning Analytics and Knowledge Conference (LAK).

Cloude, E. B., Munshi, A., Andres, Occumpaugh, J., Baker, R. S. & Biswas, G. (under review). The International Learning Analytics and Knowledge Conference (LAK).

Kiili, K., Suiko, J., **Cloude, E. B.,** & Dindar, M. (under review). Demystifying the Relations of Motivation and Emotions in Game-Based Learning: Insights from Co-Occurrence Network Analysis. *International Journal of Serious Games*.

In preparation

Baker, R. S., **Cloude, E. B.,** & Andres, J. M. A. (under review). Confusion and frustration as a spectrum. *IEEE Transactions on Affective Computing*.

Cloude, E. B., Baker, R. S. & Fouh, E. (in preparation). Facets of overconfidence in an introductory programming course. *Computers & Education*.

Suiko, J., **Cloude, E. B.,** Dindar, M., & Kiili, K. (in preparation). Epistemic curiosity during game-based learning about critical reading. *GamiFIN*.

Svabensky, V., Pankiewicz, M., Zhang, J., **Cloude, E. B.,** Baker, R. S., & Fouh, E. (in preparation). Error rate measures and programming grades. Technical Symposium on Computer Science Education.

PRESENTATIONS ([#]=Undergraduate student; [*]=remote/canceled/postponed by COVID-19)

Cloude, E. B., Zhang, J., Baker, R. S., & Fouh, E. (2024, March). *Procrastination vs. Active Delay: How Students Prepare to Code in Introductory Programming*. To be presented at the Technical Symposium on Computer Science Education (SIGCSE 2024). Oregon, USA.

Andres, J. M. Alexandra, **Cloude, E. B.,** Baker, R. S., & Lee, S. (2023, December). *Investigating Cognitive Biases in Self-Explanation Behaviors during Game-based Learning about Mathematics*. To be at the 31sth International Conference on Computers in Education (ICCE 2023). Matsue, Shimane, Japan.

Cloude, E. B., Amon, M. J., Emerson, A., Wortha, F., Azevedo, R., & Lester, J. (2023, March). *Modeling Confusion as a Nonlinear Dynamical System during Game-based Learning*. In Cloude, E. B., Baker, R. S., Mills, C., Kovanovic, V., & Gasevic, D. (Eds.), Workshop Paper Presented at AffectLA: Situating Affect in Learning Analytics, Addressing Educational Challenges, Arlington, TX, USA.

Cloude, E. B., Baker, R. S., & Fouh, E. (2023, March). *Online help-seeking occurring in multiple computer-mediated conversations affects grades in an introductory programming course*. Paper to be presented at the 13th International Learning Analytics and Knowledge Conference (LAK), Arlington, TX, USA.

Kiili, K., Juho, S., **Cloude, E.,** & Dindar, M. (2022, November). *Motivation and emotions in a health literacy game: Insights from co-occurrence network analysis*. Paper to be presented at the 11th International Conference on Games and Learning Alliance (GALA), Tampere, Finland.
- **Best Paper Session**

[*]**Cloude, E. B.,** Wortha, F., & Azevedo, R. (2021, September). *Emotions change over time: Metacognition and learning with intelligent tutoring systems*. Paper presented at the SIG 8 meets SIG 16 9th international biennial meeting of the European Association for Research on Learning and Instruction (EARLI), Dresden, Germany.

[*]**Cloude, E. B.,** Lester, J., & Azevedo, R. (2021, September). *Do eye-gaze behaviors predict self-reported motivation after game-based learning?* Paper presented at the SIG 8 meets SIG 16 9th international biennial meeting of the European Association for Research on Learning and Instruction (EARLI), Dresden, Germany.

Cloude, E. B., Gabriel, F., & Azevedo, R. (2021, August). *Capturing motivation and affect using multimodal data: Toward theory-driven learning analytics*. Paper presented at the SIG 8 Motivation and Emotion international biennial meeting of the European Association for Research on Learning and Instruction (EARLI). Virtual society meeting.

Cloude, E. B., Wortha, F., Wiedbusch, M., & Azevedo, R. (2021, July). *Goals matter: Changes in metacognitive judgments and their relation to motivation and learning with an intelligent tutoring system*. Paper presented at the International Conference on Human Computer Interaction. Virtual society meeting.

Wiedbusch, M. D., Dever, D. A., Wortha, F., **Cloude, E. B.,** & Azevedo, R. (2021, July). *Revealing data feature differences between system- and learner-initiated self-regulated learning processes within hypermedia through principal component analysis.* Paper presented at the International Conference on Human Computer Interaction. Virtual society meeting.

Azevedo, R., Wiedbusch, M. D., **Cloude, E. B.,** & Dever, D. A. (2021, April). *The effectiveness of intelligent tutoring systems on self-regulated learning: A synthesis of the literature.* Paper presented at the remote annual meeting of the American Educational Research Association (AERA).

Cloude, E. B., Azevedo, R., & Lester, J. (2021, April). *Reflection as a function of goals: Adolescents and performance during game-based learning with Crystal Island.* Paper presented at the remote annual meeting of the American Educational Research Association (AERA).

Cloude, E. B., & Azevedo, R. (2020, December). *Self-regulated learning with virtual environments: Challenges for classroom-based research.* Paper presented at the SIG 27 9th international biennial meeting of the European Association for Research on Learning and Instruction (EARLI), Antwerpen, Belgium.

Wiedbusch, M., **Cloude, E. B.,** & Azevedo, R. (2020, December). *Are online behaviors enough? Scientific reasoning and performance during game-based learning.* Paper presented at the SIG 27 9th international biennial meeting of the European Association for Research on Learning and Instruction (EARLI), Antwerpen, Belgium.

Cloude, E. B., & Azevedo, R. (2020, November). *Designing a system to assist in synchronizing, processing, analyzing, recognizing, and conceptualizing learners' multimodal self-regulated learning data with emerging technologies.* Paper presented at the Association for Educational Communications & Technologies (AECT). Virtual International Convention.

Cloude, E. B., Wortha, F., Dever, D. A., & Azevedo, R. (2020, July). *How do emotions change during learning with an intelligent tutoring system? Metacognitive monitoring and performance with MetaTutor.* Paper presented at the The 42nd Annual Meeting of the Cognitive Science Society. Virtual society meeting.

[*]**Cloude, E. B.**, [#]Doderlein, N. H., Azevedo, R., & Lester, J. (2020, April). *Are eye-gaze behaviors related to scientific-reasoning actions? Quantifying 21st century skills using eye tracking during game-based learning.* Paper presented at the annual Graduate Research Forum for the College of Graduate Studies, University of Central Florida, Orlando, Florida.

[*]Azevedo, R., Wortha, F., **Cloude, E. B.,** Wiedbusch, M, & Dever, D. (2020, April). *Supporting students' self-regulated learning using adaptive scaffolding in an intelligent tutoring system.* Paper presented at the annual meeting of the American Educational Research Association (AERA), San Francisco, US.

[*]**Cloude, E. B.,** & Azevedo, R. (2020, March). *Contextualizing multimodal learning analytics to theoretical frameworks and learning environments.* Paper presented at the workshop on Integrating multi-channel learning to model complex learning processes @ the 10th International Learning Analytics & Knowledge Conference (LAK), Frankfurt, Germany.

Azevedo, R., Taub, M., **Cloude, E.,** & Price, M. (2019, April). *Understanding self-regulatory processes using multimodal trace data during human-machine interactions with an intelligent tutoring system.* Paper presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Azevedo, R., Taub, M., Price, M., & **Cloude**, **E.** (2019, April). *Adaptive scaffolding with pedagogical agents during self-regulated learning with an intelligent tutoring system.* Paper presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Cloude, E., Price, M., Azevedo, R., Taub, M., Mudrick, V., McKenzie, K., Burnette, M., & McArdle. (2019, April). *Can all students benefit from virtual reality? Evidence from learning outcomes and process data.* Paper presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Price, M., Taub, M., **Cloude, E.,** & Azevedo, R. (2019, April). *How negative emotions impact performance and metacognitive processes use during learning with intelligent tutoring systems.* Paper presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Taub, M., Azevedo, R., Price, M., **Cloude, E.**, Rejendran, R., & Biswas, G. (2019, April). *How do emotions impact the accuracy of self-regulated processes during learning with advanced learning technologies?* Paper presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Cloude, E. B., Taub, M., & Azevedo, R. (2018, August). *The role of goal orientation on metacognitive and cognitive strategies in an intelligent tutoring system*. Paper presented at the 8th international biennial meeting of the European Association for Research on Learning and Instruction (EARLI), Zurich, Switzerland.

Cloude, E. B., Taub, M., & Azevedo, R. (2018, June). *Investigating the role of goal orientation: Metacognitive and cognitive strategy use and learning with intelligent tutoring systems*. Paper presented at the 14th International Conference on Intelligent Tutoring Systems (ITS), Montreal, Quebec, Canada.

Azevedo, R., Mudrick, N. V., Taub, M., Price, M. J., & **Cloude, E. B.** (2018, April). *External regulation by artificial agents: Can intelligent virtual humans impact learners' self-regulation during complex multimedia learning?* Paper presented at the annual meeting of the American Educational Research Association (AERA), New York, NY.

Azevedo, R., Taub, M., Mudrick, N. V., Bradbury, A. E., Price, M J., & **Cloude, E. B.** (2018, April). *Studying self-regulatory processes using multimodal trace data: What does the evidence reveal?* Paper presented at the annual meeting of the American Educational Research Association (AERA), New York, NY.

Azevedo, R., Taub, M., Mudrick, N. V., Price, M., & **Cloude, E. B.** (2018, April). *The effectiveness of pedagogical agents' adaptive scaffolding on self-regulation during complex learning with an Intelligent Tutoring System*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

POSTERS ([#] = Undergraduate student; [*] = cancelled/postponed by COVID-19)

Cloude, E. B., Baker, R. S., & Pankiewicz, M. (2023, December). *Supporting Self-regulated Learning in Computer Science with an Automated Feedback Tool.* Poster to be presented at the 31sth International Conference on Computers in Education (ICCE 2023). Matsue, Shimane, Japan.

Zhang, J., Pang, S., Andres, J.M.A., Baker, R.S., **Cloude, E.,** Nguyen, H.A., & McLaren, B. (June, 2023). *Leveraging Natural Language Processing to Detect Gaming the System in Open-ended Questions*

in a Math Digital Learning Game. Poster presented at the 33rd Annual Meeting of the Society for Text and Discourse (ST&D), Oslo, Norway.

Wortha, F., **Cloude, E. B.**, & Azevedo, R. (August, 2022). *The interaction of conscientiousness and learning strategies during learning with MetaTutor*. Poster presented at the 17th International Conference on Motivation (ICM), Dresden, Germany

Cloude, E. B., Azevedo, R., Torre, D., LaRochelle, J., Castiglioni, A., & Hernandez, C. (August, 2022). *Using multidimensional time series data to study clinical-reasoning processes between experts and novices with CResME*. Poster presented to the International Association for Medical Education (AMEE). Lyon, France/Virtual society meeting.

Cloude, E. B., Amon, M. J.., Wortha, F., Emerson, A., Azevedo, R., & Lester, J. (April, 2022). *Examining the role of confusion during game-based learning: A dynamical approach*. Poster presented at the remote annual meeting of the American Educational Research Association (AERA). Virtual society meeting.

Dever, D., Amon, M. J., Vrzakova, H., Wiedbusch, M., **Cloude, E. B.,** & Azevedo, R. (April, 2022). *Using auto-recurrence quantification analysis to examine dynamics of information-gathering behaviors and agency during game-based learning*. Poster presented at the remote annual meeting of the American Educational Research Association (AERA). Virtual society meeting.

Cloude, E. B., Wortha, F., Dever, D. A., & Azevedo, R. (Sepetember, 2021). *Negative emotional dynamics shape cognition and performance with MetaTutor: Toward building affect-aware systems*. Poster presented at the 9th International Conference on Affective Computing & Intelligent Interaction (ACII). Virtual society meeting.

Cloude, E. B., [#]Ballelos, N. A. M., Azevedo, R., Castiglioni, A., LaRochelle, J., Andrews, A., & Hernandez, C. (2021, June). *Designing intelligent systems to support medical diagnostic reasoning using process data*. Poster presented at the 22nd International Conference of Artificial Intelligence in Education (AIED). Virtual society meeting.

Dever, D. A., **Cloude, E. B.,** & Azevedo R. (2021, June). Examining learners' reflections over time during game-based learning. Poster presented at the 22nd International Conference of Artificial Intelligence in Education (AIED). Virtual society meeting.

[#]Ballelos, N. A. M., **Cloude, E. B.,** Azevedo, R., Castiglioni, A., Andrews, A., LaRochelle, J., & Hernandez, C. (2021, April). *Using digital platforms to capture diagnostic reasoning using multimodal data: Implications for enhancing medical education*. Poster presented at the UCF Student Scholar Symposium. Virtual conference.

Cloude, E. B., Azevedo, R., [#]Ballelos, N. A. M., Castiglioni, A., LaRochelle, J., Andrews, A., & Hernandez, C. A. (2021, April). *Leveraging digital platforms to capture multimodal data on diagnostic reasoning*. Poster presented at the UCF Student Scholar Symposium. Virtual conference.

- ▪ **Awarded Graduate Symposium winner**

Cloude, E. B., Wortha, F., & Azevedo, R. (2021, April). *Goals matter: Changes in metacognition and their relation to learning with MetaTutor*. Poster presented at the remote annual meeting of the American Educational Research Association (AERA).

Cloude, E. B., Wortha, F., Taub, M., & Azevedo, R. (2021, April). *Negative emotional changes and their relationship to emotion regulation and performance with an intelligent tutoring system: A latent growth curve analysis*. Poster to be presented at the remote annual meeting of the American Educational Research Association (AERA).

[#]Ballelos, N. A. M., **Cloude, E. B.,** Azevedo, R., Castiglioni, A., Andrews, A., LaRochelle, J., & Hernandez, C. (2021, February). *Using digital platforms to capture diagnostic reasoning using multimodal data: Implications for enhancing medical education*. Poster presented at the Florida Undergraduate Research Conference (FURC). Virtual conference.

Cloude, E. B., Wortha, F., Taub, M., & Azevedo, R. (2020, November). *Negative emotional changes and their relationship to emotion regulation and performance with an intelligent tutoring system: A*

latent growth curve analysis. Poster presented at the annual Research Showcase for the College of Community Innovation and Education, University of Central Florida, Orlando, Florida. Virtual conference.

- **Awarded Honorable Mention**

Dever, D. A., **Cloude, E. B.,** & Azevedo, R. (2020, July). *Does prior knowledge influence learners' cognitive and metacognitive strategies over time during game-based learning?* Poster presented at The 42nd Annual Meeting of the Cognitive Science Society (CogSci). Virtual society meeting.

*****Cloude, E. B.,** Azevedo, R., & Wortha, F. (April, 2020). *Emotions change over time: Metacognitive and cognitive processes and learning with intelligent tutoring systems.* Structured Poster to be presented at the annual meeting of the American Educational Research Association (AERA), San Francisco, US.

*****Cloude, E. B.,** Wiedbusch, M., Wortha, F., Azevedo, R., & Lester, J. (April, 2020). *Do Scientific-reasoning Processes Predict Motivation during Game-based Learning using Multichannel Data?* Poster to be presented at the annual meeting of the American Educational Research Association (AERA), San Francisco, US.

Cloude, E. B., Taub, M., Lester, J., & Azevedo. R. (2019, June). *The role of achievement goal orientation on metacognitive process use in game-based learning.* Poster presented at the annual meeting of International Artificial Intelligence in Education Society (AIED), Chicago, IL.

Cloude, E. B., Taub, M., Price, M., Lester, J., Mudrick, V., & Azevedo, R., (2019, April). *Can eye gaze behaviors predict self-reported intrinsic motivation scores during game-based learning?* Poster presented at the annual meeting of the American Educational Research Association (AERA), Toronto, Ontario, Canada.

Cloude, E. B., Taub, M., Price, M., Lester, J., Mudrick, V., & Azevedo, R., (2019, March). *Can eye-gaze behaviors predict self-reported intrinsic motivation scores during game-based learning?* Poster presented at the Annual Research Showcase for the College of Community Innovation and Education, University of Central Florida, Orlando, Florida.

- **Awarded Annual Research Showcase Scholarship**

Cloude, E. B., & Rollins, L., Riggins J. (2016, April). *Age-related differences in the fading affect in autobiographical memory*. Poster presented at the 14th Annual Paideia Conference at Christopher Newport University, Newport News, Virginia.

Cloude, E. B., & Rollins, L. (2016, April). *Development of pattern separation throughout childhood*. Poster presented at the 14th Annual Paideia Conference at Christopher Newport University, Newport News, VA.

Rollins, L., **Cloude, E.,** & Riggins, T. (2015, October). *Investigation of age-related differences in the fading affect bias in autobiographical memory*. Poster presented at the 9th Biennial Meeting of the Cognitive Development Society, Columbus, OH.

Rollins, L., **Cloude, E. B.,** & Riggins, T. (2015, October). *Effect of serial position on long-term memory in early childhood*. Poster presented at the 9th Biennial Meeting of the Cognitive Development Society, Columbus, OH.

Cloude, E., & Rollins, L. (2015, August). *The development of pattern separation throughout childhood*. Poster presented to faculty at the 1st Annual Summer Scholars Program at Christopher Newport University, Newport News, VA.

Cloude, E., & Clark, M. (2015, March). *Strengths and supports: Military affiliations on campus*. Poster presented at the Ferguson Fellowship in Social Entrepreneurship Gala at Christopher Newport University, Newport News, VA.

Cloude, E. B., & Clark, M. (2014, September). *Strengths and Supports: Military affiliations on campus*. Poster presented at the Civic Movements and Democracy conference at Christopher Newport University, Newport News, VA.

GRANTS

Awarded

Cloude, E. B. (Marie Skłodowska-Curie Postdoctoral Fellowship), Kristian Kiili (supervisor; Tampere University, Finland), Manuel Ninaus (co-supervisor; University of Graz, Austria), & Psyon Games (non-academic placement; Helsinki, Finland). *Emotional Modelling to Enhance Learning with Games (AMELIA)*. Funded by the European Commission..

Baker, R. S. (PI; University of Pennsylvania), Chen, B. (Co-PI; University of Pennsylvania), Botelho, A. (Co-PI; University of Florida), **Cloude, E. B. (Co-PI; University of Pennsylvania)**, & Neisler, J. (Co-PI; Digital Promise). *Methods Training in Data Science for Education Researchers*. Funded by the Institute of Education Sciences.

Kellogg, S (PI; North Carolina State University), Baker, R. S. (Co-PI; University of Pennsylvania), **Cloude, E. B. (Co-PI; University of Pennsylvania)**. *Collaborative Research: BCSER: Learning Analytics in STEM Ed Research - Broadening Education in Advanced Methods (LASER BEAM)*. Funded by the National Science Foundation.

Rokovic, M. (PI; Monash University, Australia), **Cloude, E. B. (Co-PI; Tampere University, Finland)**, & Bardach, L (Co-PI; University of Tubingen, Germany). *Flora Fox: Comprehensively studying Self-regulated learning during Writing Tasks*. Funded by the Jacobs Foundation [180,000 Swiss Franks].

Under review

HONORS & AWARDS

2023	Marie Skłodowska-Curie Postdoctoral Fellowship
2021	Presentation Fellowship, University of Central Florida
2021	Graduate Student Scholar Symposium Winner, University of Central Florida
2020	Presentation Fellowship, University of Central Florida
2020	Virtual Research Showcase Honorable Mention, University of Central Florida
2019	Annual Research Showcase Scholarship, University of Central Florida
2015	Summer Scholars Program, Christopher Newport University
2015	Travel Fellowship, Christopher Newport University
2014	Ferguson Fellowship for Social Entrepreneurs, Christopher Newport University

TEACHING EXPERIENCE

Teaching Assistant
IDS 7501-001 Issues & Research in Education (Graduate level), University of Central Florida, Fall 2019

PSY 301 Research Methods in Psychology (Undergrad level), Christopher Newport University, Fall 2015

Guest Lecturer

KAS.KAA.191 Foundations of Game-based Learning (Graduate level), Tampere University, Fall 2023

EDUC 5145 Adaptive Learning Systems (Graduate level), University of Pennsylvania, Fall 2022

IDS 7501-001 Issues & Research in Education (Graduate level), University of Central Florida, Fall 2021

PROFESSIONAL ACTIVITIES

Reviewer

2022 - Present	*International Conference on Knowledge and Learning Analytics*
2022 - Present	*International Journal of Artificial Intelligence in Education*
2022 - 2023	*Frontiers in Psychology*
2022 - 2023	*Frontiers in Medicine*
2022 – 2023	*Computers in Human Behavior*
2021 – 2023	*International Journal of Educational Research*
2021 – 2023	*Computers & Education*
2020 – Present	*Journal of Learning Analytics*
2020 – 2022	*Discourse Processes: Special Issue on Emotions in Reading, Learning and Communication*
2021 – 2022	*Conference on Human Factors in Computing Systems*
2020 – 2022	*American Educational Research Association*
2020 – 2021	*Association for Educational Communications & Technology*
2020 – 2021	*European Association for Research on Learning and Instruction, SIG 8: Motivation and Emotion*
2020 – 2021	*European Association for Research on Learning and Instruction, SIG 16: Metacognition*
2020 – 2021	*European Association for Research on Learning and Instruction, SIG 27: Online measures of learning processes*

Workshop & Symposia

Cloude, E. B., Baker, R. S., Mills, C., Kovanović, V., & Gašević, D. (2023). **Situating Affect in Learning Analytics: Addressing Educational Challenges**. *Learning Analytics and Knowledge Workshop*.

Poquet, O., Dindar, M., **Cloude, E. B.,** Allen, L., & Dever, D. A. (2024). **Advancing Learning Analytics with Complex Dynamical Systems: Trends and Challenges in Non-Linear Modeling of Learning Data**. *Learning Analytics and Knowledge Workshop*.

Membership & Committees

2021– 2022	*Artificial Intelligence in Education Steering Committee Member,* Center for Integrative Research in Computing and Learning Sciences
2021– 2022	*Studying and Self-regulated Learning SIG Graduate Student Committee Chair*, American Educational Research Association
2021– 2022	*Graduate Student Pairing Program*, American Educational Research Association

2020 – 2021	Association for Educational Communications & Technologies
2020 – 2021	*Studying and Self-regulated Learning SIG Graduate Student Committee*, American Educational Research Association
2018 – Present	*Studying and Self-regulated Learning SIG*, American Educational Research Association
2020 – Present	Society for Learning Analytics Research
2020 – 2021	Cognitive Science Society
2019 – 2022	International Artificial Intelligence in Education Society
2018 – 2019	International Society on Intelligent Tutoring Systems
2015 – 2016	Cognitive Development Society

Invited Webinars and Talks

2023	Society for Learning Analytics Research, *Unveiling the Power of Affect during Learning*; link to recording: https://youtu.be/HwZyua3DvG4

DESIGNING AND DEVELOPING EDUCATIONAL TECHNOLOGIES

Game-based learning environments for STEM

2022 – 2023   **Decimal Point**

Postdoctoral research fellow contributing to interdisciplinary research project (PI: Bruce McLaren, Carnegie Mellon University; Co-PI: Ryan Baker, Graduate School of Education, University of Pennsylvania). This project is designed to assess gender differences using a multidimensional measure of gender identity to assess differences in students' game-based learning using a large-scale approach.

2019 – 2021   **Crystal Island: Reflect**

Graduate research assistant contributing to an interdisciplinary project in collaboration with faculty, graduate students, and postdoctoral fellows at North Carolina State (PI: Dr. James Lester; Co-PI: Dr. Roger Azevedo) Crystal Island REFLECT is a game-based learning environment built to enhance scientific reasoning, problem solving, and learning about STEM topics using tools that scaffold reflection. Specifically, reflection is scaffolded using written prompts that are triggered based on event- and time-based production rules. The production rules are built off of on-line behavioral traces that represent actions critical for problem solving and scientific reasoning in order to be successful in completing the game.

Intelligent Tutoring System

2017 – 2021   **MetaTutor**

Graduate research assistant contributing to an interdisciplinary project in collaboration with faculty, graduate students, and postdoctoral fellows at North Carolina State (PI: Dr. James Lester; Co-PI: Dr. Roger Azevedo) Crystal Island REFLECT is a game-based learning environment built to enhance scientific reasoning, problem solving, and learning about STEM topics using tools that scaffold reflection. Specifically, reflection is scaffolded using written prompts that are triggered based on event- and time-based production rules. The production rules are built off of on-line behavioral traces that represent actions critical for problem solving and scientific reasoning in order to be successful in completing the game.

Hypermedia

2019 – 2021   **Cresme**

Graduate research assistant contributing to an interdisciplinary project (PI: Dr. Caridad Hernandez, Department of Internal Medicine; Co-PIs: Dr. Roger Azevedo, Department of Learning Sciences and Educational Research, Dr. Analia Castiglioni, Department of Internal Medicine and Dr. Jeffry LaRochelle, Department of Internal Medicine. CResME is a multimedia learning environment that presents patient information for multiple diseases related to the common cough via nodes that reflect history of illness information like symptomology. Specifically, nodes of patient information were randomly placed to represent an ill-structured illness script, and participants are required to connect the nodes to each patient's history and write a final diagnosis. Many tools are built into CResME to scaffold diagnostic reasoning: (1) lab values illustrating normal ranges for lab results associated with sex; (2) a legend which indicated the full name of medical abbreviations; and (3) images of chest X-rays or Spirometry tests.

Open-learning Environments

2018 – 2021   **Future Worlds**

Graduate research assistant contributing to an interdisciplinary project (PI: Dr. James Lester, North Carolina State University, Department of Computer Science; Co-PIs: Dr. Roger Azevedo, UCF Department of Learning Sciences and Educational Research, Dr. Jonathan Rowe, North Carolina State University, Intellimedia Group. Future Worlds is a hypermedia-based learning environment with open-learner models built to enhance learners' self-regulation and reflection using tools and open-learner models while solving environmental and sustainability problems.

Dashboards for Teaching and Learning

2017 – 2018   **MetaDash**

Graduate research assistant contributing to an interdisciplinary project (PI: Roger Azevedo, UCF, Co-PIs: Min Chi in Computer Science and Soonhye Park in STEM education, NCSU) involving the design, development, and evaluation of teacher dashboards they can use to monitor and track how their students engage in self-regulated learning while learning in a classroom setting.

Immersive Virtual Reality

2017 – 2018   **Virtual Reality STEM problem**

Graduate research assistant contributing to an interdisciplinary project involving the design, development and evaluation of how middle, high school, and college students monitor and track self-regulated learning while in an immersive environment to solve a STEM problem about photosynthesis.

CERTIFICATIONS

CITI Human Subjects Research- Group Social/Behavioral Research Investigators and Key Personnel; CITI Social and Behavioral Responsible Conduct of Research; CITI Principal Investigators & Researchers EC

SOFTWARE

Programming languages: R/RStudio (expert/highly proficient), Python (proficient), SAS (proficient), MATLAB (novice), SQL (novice)

Tools: GitHub, REDCap, Qualtrics, Affectiva Facial Tracking Software, Tobii Studio, Warp PLS, IBM SPSS, LaTex, Overleaf, Adobe Photoshop, InDesign, Microsoft Office, HLM, Canva, iMotions Attention Tool

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EQUIPMENT

Tobii Pro Glasses 2 (wearable eye tracker), Tobii Pro X3-120 eye tracker, Shimmer3 GSR+ (physiological device), Vive Pro Headset (Virtual reality headset with eye tracking), Oculus Quest (virtual reality headset)