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Assessment and learning engagement in massive open online courses

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References



- Abbakumov, D., Desmet, P., & Van den Noortgate, W. (2020). Rasch model extensions for enhanced formative assessments in MOOCs. *Applied Measurement in Education*, 33(2), 113-123. <https://doi.org/10.1080/08957347.2020.1732382>
- Admiraal, W., Huisman, B., & Pilli, O. (2015). Assessment in massive open online courses. *Electronic Journal of E-learning*, 13(4), 207-216. Retrieved from <https://academic-publishing.org/index.php/ejel/article/view/1728/1691>
- Admiraal, W., Louws, M., Lockhorst, D., Paas, T., Buynsters, M., Cviko, A., Janssen, C., de Jonge, M., Nouwens, S., & Post, L. (2017). Teachers in school-based technology innovations: A typology of their beliefs on teaching and technology. *Computers & Education*, 114, 57-68. <https://doi.org/10.1016/j.compedu.2017.06.013>
- Admiraal, W. F., Lockhorst, D., Wubbels, T., Korthagen, F. A., & Veen, W. (1998). Computer-mediated communication environments in teacher education: Computer conferencing and the supervision of student teachers. *Learning Environments Research*, 1, 59-74. <https://doi.org/10.1023/A:1009936715640>
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In Kuhl, J., Beckmann, J. (Eds.), *Action control*, 11-39. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-69746-3_2
- Al-Rahmi, W. M., Yahaya, N., Alamri, M. M., Alyoussef, I. Y., Al-Rahmi, A. M., & Kamin, Y. B. (2019). Integrating innovation diffusion theory with technology acceptance model: Supporting students' attitude towards using a massive open online courses (MOOCs) systems. *Interactive Learning Environments*, 1-13. <https://doi.org/10.1080/10494820.2019.1629599>
- Alario-Hoyos, C., Pérez-Sanagustín, M., Delgado-Kloos, C., & Muñoz-Organero, M. (2014). Delving into participants' profiles and use of social tools in MOOCs. *Ieee Transactions on Learning Technologies*, 7(3), 260-266. <https://doi.org/10.1109/TLT.2014.2311807>
- Albelbisi, N., Yusop, F. D., & Salleh, U. K. M. (2018). Mapping the factors influencing success of massive open online courses (MOOC) in higher education. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(7), 2995-3012. <https://doi.org/10.29333/ejmste/91486>
- Albelbisi, N. A. (2020). Development and validation of the MOOC success scale (MOOC-SS). *Education and Information Technologies*, 25(5), 4535-4555. <https://doi.org/10.1007/s10639-020-10186-4>
- Albelbisi, N. A., & Yusop, F. D. (2019). Factors influencing learners' self-regulated learning skills in a massive open online course (MOOC) environment. *Turkish Online Journal of Distance Education*, 20(3), 1-16. <https://doi.org/10.17718/tojde.598191>
- Alexandron, G., Wilttrout, M. E., Berg, A., & Ruipérez-Valiente, J. A. (2020, March 23-27). Assessment that matters: Balancing reliability and learner-centered pedagogy in MOOC assessment. *Proceedings of the Tenth International Conference on Learning Analytics & Knowledge*, 512-517. Frankfurt, Germany. <https://doi.org/10.1145/3375462.3375464>
- Almatrafi, O., & Johri, A. (2018). Systematic review of discussion forums in massive open online courses (MOOCs). *IEEE Transactions on Learning Technologies*, 12(3), 413-428. <https://doi.org/10.1109/TLT.2018.2859304>

- Almeda, M. V., Zuech, J., Baker, R.S., Utz, C., Higgins, G., & Reynolds, R. (2018). Comparing the factors that predict completion and grades among for-credit and open/MOOC students in online learning. *Online Learning*, 22(1), 1-18. <https://doi.org/10.24059/olj.v22i1.1060>
- Altalhi, M. M. (2021). Towards understanding the students' acceptance of MOOCs: A unified theory of acceptance and use of technology (UTAUT). *International Journal of Emerging Technologies in Learning (iJET)*, 16(2), 237-253. <https://doi.org/10.3991/ijet.v16i02.13639>
- Anne Clark, R. (2002). Learning outcomes: The bottom line. *Communication Education*, 51(4), 396-404. <https://doi.org/10.1080/03634520216531>
- Artino, A. R. (2008). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. *Journal of Computer Assisted Learning*, 24(3), 260-270. <https://doi.org/10.1111/j.1365-2729.2007.00258.x>
- Artino, A. R. (2009). Think, feel, act: Motivational and emotional influences on military students' online academic success. *Journal of computing in higher education*, 21(2), 146-166. <https://doi.org/10.1007/s12528-009-9020-9>
- Badali, M., Hatami, J., Banihashem, S. K., Rahimi, E., Noroozi, O., & Eslami, Z. (2022). The role of motivation in MOOCs' retention rates: a systematic literature review. *Research and Practice in Technology Enhanced Learning*, 17(1), 5. <https://doi.org/10.1186/s41039-022-00181-3>
- Balint, T. A., Teodorescu, R., Colvin, K., Choi, Y.-J., & Pritchard, D. (2017). Physics instructional resource usage by high-, medium-, and low-skilled MOOC students. *The Physics Teacher*, 55(4), 222-225. <https://doi.org/10.1119/1.4978719>
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191-215. <https://psycnet.apa.org/doi/10.1037/0033-295X.84.2.191>
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational psychologist*, 28(2), 117-148. https://doi.org/10.1207/s15326985ep2802_3
- Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Eds.), *Encyclopedia of human behavior*, 4, 71-81. Academic Press.
- Barak, M., Watted, A., & Haick, H. (2016). Motivation to learn in massive open online courses: Examining aspects of language and social engagement. *Computers & Education*, 94, 49-60. <https://doi.org/10.1016/j.compedu.2015.11.010>
- Barman, L., Naimi-Akbar, I., & Jansson, M. (2019, October 16-19). Reframing the design for learning in MOOCs. *Proceedings of the 2019 IEEE Frontiers in Education Conference*, 1-7. Covington, United States. <https://doi.org/10.1109/FIE43999.2019.9028428>
- Baturay, M. H. (2015). An overview of the world of MOOCs. *Procedia-Social and Behavioral Sciences*, 174, 427-433. <https://doi.org/10.1016/j.sbspro.2015.01.685>
- Behling, O., & Law, K. S. (2000). *Translating questionnaires and other research instruments: Problems and solutions*. Sage.
- Bell, F. (2011). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *International Review of Research in Open and Distributed Learning*, 12(3), 98-118. <https://doi.org/10.19173/irrodl.v12i3.902>

- Berge, Z. L. (1995). The role of the online instructor/facilitator. *Educational technology*, 35(1), 22-30. Retrieved from <https://trainingthetrainers2010.pbworks.com/f/The+Role+of+the+Online+Instructor.pdf>
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher education*, 32(3), 347-364. <https://doi.org/10.1007/BF00138871>
- Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher education research & development*, 18(1), 57-75. <https://doi.org/10.1080/0729436990180105>
- Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *The International Review of Research in Open and Distributed Learning*, 13(1), 56-71. <https://doi.org/10.19173/irrodl.v13i1.1076>
- Bloom Benjamin, S. (1956). *Taxonomy of Educational Objectives. Handbook I: Cognitive Domain*. David McKay Company.
- Bonafini, F., Chae, C., Park, E., & Jablow, K. (2017). How much does student engagement with videos and forums in a MOOC affect their achievement? *Online Learning Journal*, 21(4), 223-240. <https://doi.org/10.24059/olj.v21i4.1270>
- Bonafini, F. C. (2017). The effects of participants' engagement with videos and forums in a MOOC for teachers' professional development. *Open Praxis*, 9(4), 433-447. <https://doi.org/10.5944/openpraxis.9.4.637>
- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, 17(1), 1-30. <https://doi.org/10.1186/s41239-019-0176-8>
- Bralić, A., & Divjak, B. (2018). Integrating MOOCs in traditionally taught courses: achieving learning outcomes with blended learning. *International Journal of Educational Technology in Higher Education*, 15(1), 2. <https://doi.org/10.1186/s41239-017-0085-7>
- Brislin, R. W. (1986). The wording and translation of research instruments. In W. J. Lonner & J. W. Berry (Eds.), *Field methods in cross-cultural research*, 137-164). Sage Publications, Inc.
- Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, 27, 1-13. <https://doi.org/10.1016/j.iheduc.2015.04.007>
- Brooker, A., Corrin, L., De Barba, P., Lodge, J., & Kennedy, G. (2018). A tale of two MOOCs: How student motivation and participation predict learning outcomes in different MOOCs. *Australasian Journal of Educational Technology*, 34(1). <https://doi.org/10.14742/ajet.3237>
- Brophy, J. (2000). *Teaching. Educational Practices. Series 1*. International Bureau of Education, Geneva.
- Büchele, S. (2021). Evaluating the link between attendance and performance in higher education: the role of classroom engagement dimensions. *Assessment & Evaluation in Higher Education*, 46(1), 132-150. <https://doi.org/10.1080/02602938.2020.1754330>
- Buhr, E. E., Daniels, L. M., & Goegan, L. D. (2019). Cognitive appraisals mediate relationships between two basic psychological needs and emotions in a massive open online course. *Computers in Human Behavior*, 96, 85-94. <https://doi.org/10.1016/j.chb.2019.02.009>

- Cagiltay, N. E., Cagiltay, K., & Celik, B. (2020). An analysis of course characteristics, learner characteristics, and certification rates in MITx MOOCs. *International Review of Research in Open and Distributed Learning*, 21(3), 121-139.
<https://doi.org/10.19173/irrodl.v21i3.4698>
- Camarata, T., & Slieman, T. A. (2020). Improving student feedback quality: A simple model using peer review and feedback rubrics. *Journal of medical education and curricular development*, 7. <https://doi.org/10.1177/2382120520936604>
- Celik, B., & Cagiltay, K. (2024). Uncovering MOOC completion: A comparative study of completion rates from different perspectives. *Open Praxis*, 16(3), 445-456.
<https://doi.org/10.55982/openpraxis.16.3.606>
- Chang, J. J., Lin, W. S., & Chen, H. R. (2019). How attention level and cognitive style affect learning in a MOOC environment? Based on the perspective of brainwave analysis. *Computers in Human Behavior*, 100, 209-217.
<https://doi.org/10.1016/j.chb.2018.08.016>
- Chauhan, A. (2014). Massive open online courses (MOOCS): Emerging trends in assessment and accreditation. *Digital Education Review*(25), 7-17.
Retrieved from <https://revistes.ub.edu/index.php/der/article/view/11325/pdf>
- Chen, G., Lo, C. K., & Hu, L. (2020). Sustaining online academic discussions: Identifying the characteristics of messages that receive responses. *Computers & Education*, 156, 103938. <https://doi.org/10.1016/j.compedu.2020.103938>
- Chen, M., Wang, X., Wang, J., Zuo, C., Tian, J., & Cui, Y. (2021). Factors affecting college students' continuous intention to use online course platform. *SN Computer Science*, 2(2), 1-11. <https://doi.org/10.1007/s42979-021-00498-8>
- Chen, Y. H., & Chen, P. J. (2015). MOOC study group: Facilitation strategies, influential factors, and student perceived gains. *Computers & Education*, 86, 55-70.
<https://doi.org/10.1016/j.compedu.2015.03.008>
- Chen, Z., Alcorn, B., Christensen, G., Eriksson, N., Koller, D., & Emanuel, E. (2015). Who's benefiting from MOOCs, and why. *Harvard Business Review*, 22.
<https://hbr.org/2015/09/whos-benefiting-from-moocs-and-why>
- Cheng, G., & Chau, J. (2013). Exploring the relationship between students' self-regulated learning ability and their ePortfolio achievement. *The Internet and Higher Education*, 17, 9-15. <https://doi.org/10.1016/j.iheduc.2012.09.005>
- Cheng, H. F., Yu, B., Fu, S., Zhao, J., Hecht, B., Konstan, J., Terveen, L., Yarosh, S., & Zhu, H. (2019, June 24-25). Teaching UI design at global scales: A case study of the design of collaborative capstone projects for MOOCs. *Proceedings of the Sixth (2019) ACM Conference on Learning @ Scale*, 1-11. Chicago, United States.
<https://doi.org/10.1145/3330430.3333635>
- Chi, M. T. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in cognitive science*, 1(1), 73-105.
<https://doi.org/10.1111/j.1756-8765.2008.01005.x>
- Chi, M. T., Adams, J., Bogusch, E. B., Bruchok, C., Kang, S., Lancaster, M., Levy, R., Li, N., McEldoon, K. L., & Stump, G. S. (2018). Translating the ICAP theory of cognitive engagement into practice. *Cognitive science*, 42(6), 1777-1832.
<https://doi.org/10.1111/cogs.12626>

- Chi, M. T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational psychologist*, 49(4), 219-243.
<https://doi.org/10.1080/00461520.2014.965823>
- Chiu, T. K. F., & Hew, T. K. F. (2018). Factors influencing peer learning and performance in MOOC asynchronous online discussion forum. *Australasian Journal of Educational Technology*, 34(4), 16. <https://doi.org/10.14742/ajet.3240>
- Comer, D. (2017). Learning transfer, feedback, and massive open online courses. *Journal of Systemics, Cybernetics and Informatics*, 15 ((1)), 44-52. Retrieved from <https://www.iisci.org/Journal/pdv/sci/pdfs/SA611XH16.pdf>
- Conijn, R., Van Den Beemt, A., & Cuijpers, P. (2018). Predicting student performance in a blended MOOC. *Journal of Computer Assisted Learning*, 34(5), 615-628.
<https://doi.org/10.1111/jcal.12270>
- Coudeville, G. R., Boulley-Escriva, G., Finez, L., Eugène, K., & Robin, N. (2020). An experimental investigation of claimed self-handicapping strategies across motivational climates based on achievement goal and self-determination theories. *Educational Psychology*, 40(8), 1002-1021. <https://doi.org/10.1080/01443410.2020.1746237>
- Crossley, S., Paquette, L., Dascalu, M., McNamara, D. S., & Baker, R. S. (2016, April 25-29). Combining click-stream data with NLP tools to better understand MOOC completion. *Proceedings of the sixth international conference on learning analytics & knowledge*, 6-14. Edinburgh, United Kingdom. <https://doi.org/10.1145/2883851.2883931>
- Dale, V. H., & Singer, J. (2019). Learner experiences of a blended course incorporating a MOOC on Haskell functional programming. *Research in Learning Technology*, 27.
<https://doi.org/10.25304/rlt.v27.2248>
- Dalipi, F., Imran, A. S., & Kastrati, Z. (2018, April 17-20). MOOC dropout prediction using machine learning techniques: Review and research challenges. *2018 IEEE global engineering education conference (EDUCON)*, 1007-1014. Santa Cruz de Tenerife, Spain. <https://doi.org/10.1109/EDUCON.2018.8363340>
- Dandache, S., Frenay, M., Van Nes, M.-C., & Verschuren, F. (2017). A massive open online course (MOOC) for implementing pedagogical tools in undergraduate respiratory physiology. *HAPS Educator*, 21(2), 36. <https://doi.org/10.21692/haps.2017.013>
- Day, I. N., van Blankenstein, F. M., Westenberg, M., & Admiraal, W. (2018). A review of the characteristics of intermediate assessment and their relationship with student grades. *Assessment & Evaluation in Higher Education*, 43(6), 908-929.
<https://doi.org/10.1080/02602938.2017.1417974>
- De Freitas, S. I., Morgan, J., & Gibson, D. (2015). Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision. *British Journal of Educational Technology*, 46(3), 455-471.
<https://doi.org/10.1111/bjet.12268>
- de Lima, M., & Zorrilla, M. E. (2017). Social networks and the building of learning communities: An experimental study of a social MOOC. *International Review of Research in Open and Distributed Learning*, 18(1), 40-64.
<https://doi.org/10.19173/irrodl.v18i1.2630>
- DeBoer, J., Haney, C., Atiq, S. Z., Smith, C., & Cox, D. (2019). Hands-on engagement online: using a randomised control trial to estimate the impact of an at-home lab kit on student

- attitudes and achievement in a MOOC. *European Journal of Engineering Education*, 44(1-2), 234-252. <https://doi.org/10.1080/03043797.2017.1378170>
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: the self-determination theory perspective. *Journal of Personality*, 62(1), 119-134. <https://doi.org/10.1111/j.1467-6494.1994.tb00797.x>
- Deci, E. L., & Ryan, R. M. (1985a). The general causality orientations scale: Self-determination in personality. *Journal of research in personality*, 19(2), 109-134. [https://doi.org/10.1016/0092-6566\(85\)90023-6](https://doi.org/10.1016/0092-6566(85)90023-6)
- Deci, E. L., & Ryan, R. M. (1985b). *Intrinsic motivation and self-determination in human behaviour*. Plenum.
- Deci, E. L., & Ryan, R. M. (1985c). *Motivation and self-determination in human behavior*. Plenum.
- Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of personality and social psychology*, 53(6), 1024-1037. <https://doi.org/10.1037//0022-3514.53.6.1024>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry*, 11(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01
- Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian psychology/Psychologie canadienne*, 49(1), 14-23. <https://doi.org/10.1037/0708-5591.49.1.14>
- Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational psychologist*, 26(3-4), 325-346. <https://doi.org/10.1080/00461520.1991.9653137>
- del Mar Sánchez-Vera, M., & Prendes-Espinosa, M. P. (2015). Beyond objective testing and peer assessment: alternative ways of assessment in MOOCs. *International Journal of Educational Technology in Higher Education*, 12(1), 119-130. <https://doi.org/10.7238/rusc.v12i1.2262>
- Deng, R., Benckendorff, P., & Gannaway, D. (2019). Progress and new directions for teaching and learning in MOOCs. *Computers & Education*, 129, 48-60. <https://doi.org/10.1016/j.compedu.2018.10.019>
- Deng, R., Benckendorff, P., & Gannaway, D. (2020a). Learner engagement in MOOCs: Scale development and validation. *British Journal of Educational Technology*, 51(1), 245-262. <https://doi.org/10.1111/bjet.12810>
- Deng, R., Benckendorff, P., & Gannaway, D. (2020b). Linking learner factors, teaching context, and engagement patterns with MOOC learning outcomes. *Journal of Computer Assisted Learning*. <https://doi.org/10.1111/jcal.12437>
- Downes, S. (2008). Places to go: Connectivism & connective knowledge. *Innovate: Journal of Online Education*, 5(1), 6.
Retrieved from <https://nsuworks.nova.edu/innovate/vol5/iss1/6>
- Duan, J., Xie, K., Hawk, N. A., Yu, S., & Wang, M. (2019). Exploring a personal social knowledge network (PSKN) to aid the observation of connectivist interaction for high- and low-performing learners in connectivist massive open online courses. *British Journal of Educational Technology*, 50(1), 199-217.

- <https://doi.org/10.1111/bjet.12687>
- Ebben, M., & Murphy, J. S. (2014). Unpacking MOOC scholarly discourse: a review of nascent MOOC scholarship. *Learning, Media and Technology*, 39(3), 328-345. <https://doi.org/10.1080/17439884.2013.878352>
- Eccles, J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J., and Midgley, C. (1983). Expectancies, values and academic behaviors. In J. T. Spence (Eds.), *Achievement and achievement motives*, 75-146. Freeman.
- Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology*, 61, 101859. <https://doi.org/10.1016/j.cedpsych.2020.101859>
- Eccleston, C., Doherty, K., Bindoff, A., Robinson, A., Vickers, J., & McInerney, F. (2019). Building dementia knowledge globally through the understanding dementia massive open online course (MOOC). *npj Science of Learning*, 4(1), 3. <https://doi.org/10.1038/s41539-019-0042-4>
- Edwards, O. V., & Taasoobshirazi, G. (2022). Social presence and teacher involvement: The link with expectancy, task value, and engagement. *The Internet and Higher Education*, 100869. <https://doi.org/10.1016/j.iheduc.2022.100869>
- Elizondo-Garcia, J., & Gallardo, K. (2020). Peer feedback in learner-learner interaction practices. Mixed Methods Study on an xMOOC. *Electronic Journal of E-learning*, 18(2), 122-135. <https://doi.org/10.34190/EJEL.20.18.2.002>
- Emanuel, J. P., & Lamb, A. (2017). Open, online, and blended: Transactional interactions with MOOC content by learners in three different course formats. *Online Learning*, 21(2), n2. <https://dx.doi.org/10.2139/ssrn.2666657>
- Ewais, A., Awad, M., & Hadia, K. (2020). Aligning learning materials and assessment with course learning outcomes in MOOCs using data mining techniques. In Hatzilygeroudis, I., Perikos, I., Grivokostopoulou, F. (Eds) *Advances in Integrations of Intelligent Methods. Smart Innovation, Systems and Technologies*, 170, 1-25. Springer, Singapore. https://doi.org/10.1007/978-981-15-1918-5_1
- Farrow, E., Moore, J., & Gašević, D. (2022). Markers of cognitive quality in student contributions to online course discussion forums. *Journal of Learning Analytics*, 9(2), 38-65. <https://doi.org/10.18608/jla.2022.7250>
- Fávero, L. P., Hair Jr, J. F., Souza, R. d. F., Albergaria, M., & Brugni, T. V. (2021). Zero-inflated generalized linear mixed models: A better way to understand data relationships. *Mathematics*, 9(10), 1100. <https://doi.org/10.3390/math9101100>
- Ferguson, E., & Cox, T. (1993). Exploratory factor analysis: A users' guide. *International journal of selection and assessment*, 1(2), 84-94. <https://doi.org/10.1111/j.1468-2389.1993.tb00092.x>
- Flake, J. K., Barron, K. E., Hulleman, C., McCoach, B. D., & Welsh, M. E. (2015). Measuring cost: The forgotten component of expectancy-value theory. *Contemporary Educational Psychology*, 41, 232-244. <https://doi.org/10.1016/j.cedpsych.2015.03.002>
- Formanek, M., Wenger, M. C., Buxner, S. R., Impey, C. D., & Sonam, T. (2017). Insights about large-scale online peer assessment from an analysis of an astronomy MOOC. *Computers & Education*, 113, 243-262. <https://doi.org/10.1016/j.compedu.2017.05.019>

- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
<https://doi.org/10.1177/002224378101800104>
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, 74(1), 59-109.
<https://doi.org/10.3102/00346543074001059>
- Fryer, L. K., & Ainley, M. (2019). Supporting interest in a study domain: A longitudinal test of the interplay between interest, utility-value, and competence beliefs. *Learning and Instruction*, 60, 252-262. <https://doi.org/10.1016/j.learninstruc.2017.11.002>
- Galikyan, I., Admiraal, W., & Kester, L. (2021). MOOC discussion forums: The interplay of the cognitive and the social. *Computers & Education*, 165, 104133.
<https://doi.org/10.1016/j.compedu.2021.104133>
- Garay, A. M., Hashimoto, E. M., Ortega, E. M., & Lachos, V. H. (2011). On estimation and influence diagnostics for zero-inflated negative binomial regression models. *Computational Statistics & Data Analysis*, 55(3), 1304-1318.
<https://doi.org/10.1016/j.csda.2010.09.019>
- Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2-3), 87-105. [https://doi.org/10.1016/S1096-7516\(00\)00016-6](https://doi.org/10.1016/S1096-7516(00)00016-6)
- Garver, M. S., & Mentzer, J. T. (1999). Logistics research methods: employing structural equation modeling to test for construct validity. *Journal of business logistics*, 20(1), 33. Retrieved from <https://www.proquest.com/scholarly-journals/logistics-research-methods-employing-structural/docview/212605730/se-2>
- Ghazali, N., Nordin, M. S., Abdullah, A., & Ayub, A. F. M. (2020). The relationship between students' MOOC-efficacy and meaningful learning. *Asian Journal of University Education*, 16(3), 89-101.
 Retrieved from <https://files.eric.ed.gov/fulltext/EJ1274304.pdf>
- Gillani, N., & Eynon, R. (2014). Communication patterns in massively open online courses. *The Internet and Higher Education*, 23, 18-26.
<https://doi.org/10.1016/j.iheduc.2014.05.004>
- Goggins, S. P., Galyen, K., Petakovic, E., & Laffey, J. M. (2016). Connecting performance to social structure and pedagogy as a pathway to scaling learning analytics in MOOCs: An exploratory study. *Journal of Computer Assisted Learning*, 32(3), 244-266.
<https://doi.org/10.1111/jcal.12129>
- Gorgun, G., Yildirim-Erbaşlı, S. N., & Epp, C. D. (2022). Predicting cognitive engagement in online course discussion forums. *Proceedings of the 15th International Conference on Educational Data Mining*, 53(60), 61-62.
<https://doi.org/10.5281/zenodo.6853149>
- Guo, J., Parker, P. D., Marsh, H. W., & Morin, A. J. (2015). Achievement, motivation, and educational choices: A longitudinal study of expectancy and value using a multiplicative perspective. *Developmental psychology*, 51(8), 1163.
<https://doi.org/10.1037/a0039440>
- Handoko, E., Gronseth, S. L., McNeil, S. G., Bonk, C. J., & Robin, B. R. (2019). Goal setting and MOOC completion: A study on the role of self-regulated learning in student

- p performance in massive open online courses.
- International Review of Research in Open and Distributed Learning*
- , 20(3).
- <https://doi.org/10.19173/irrodl.v20i4.4270>
- Harvey, L. A., Glinsky, J. V., Muldoon, S., & Chhabra, H. S. (2017). Massive open online courses for educating physiotherapists about spinal cord injuries: a descriptive study. *Spinal cord series and cases*, 3, 17005. <https://doi.org/10.1038/scsandc.2017.5>
- Haw, J. Y., & King, R. B. (2023). Perceived need-supportive leadership, perceived need-supportive teaching, and student engagement: A self-determination perspective. *Social Psychology of Education*, 26(5), 1289-1319. <https://doi.org/10.1007/s11218-023-09790-2>
- Hayes, A. F., & Little, T. D. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (2nd ed.)*. Guilford publications.
- Haythornthwaite, C. (1996). Social network analysis: An approach and technique for the study of information exchange. *Library & information science research*, 18(4), 323-342. [https://doi.org/10.1016/S0740-8188\(96\)90003-1](https://doi.org/10.1016/S0740-8188(96)90003-1)
- Haythornthwaite, C., & De Laat, M. (2012). Social network informed design for learning with educational technology. In A. Olofsson & J. Lindberg (Eds.), *Informed design of educational technologies in higher education: Enhanced learning and teaching*, 352-374. IGI Global Scientific Publishing. <https://doi.org/10.4018/978-1-61350-080-4.ch018>
- He, C., Ma, P., Zhou, L., & Wu, J. (2018). Is participating in MOOC forums important for students? A data-driven study from the perspective of the supernetwork. *Journal of Data and Information Science*, 3(2), 62-77. <https://doi.org/10.2478/jdis-2018-0009>
- Hecking, T., Chounta, I. A., & Hoppe, H. U. (2017). Role modelling in MOOC discussion forums. *Journal of Learning Analytics*, 4(1), 85-116. <https://doi.org/10.18608/jla.2017.41.6>
- Henderikx, M. A., Kreijns, K., & Kalz, M. (2017). Refining success and dropout in massive open online courses based on the intention-behavior gap. *Distance Education*, 38(3), 353-368. <https://doi.org/10.1080/01587919.2017.1369006>
- Hendriks, R. A., de Jong, P. G., Admiraal, W. F., & Reinders, M. E. (2020). Instructional design quality in medical massive open online courses for integration into campus education. *Medical teacher*, 42(2), 156-163. <https://doi.org/10.1080/0142159X.2019.1665634>
- Hendriks, R. A., de Jong, P. G., Admiraal, W. F., & Reinders, M. E. (2024). Motivation for learning in campus-integrated MOOCs: Self-determined students, grade hunters and teacher trusters. *Computers and Education Open*, 6, 100158. <https://doi.org/10.1016/j.caeo.2023.100158>
- Henri, F. (1992). Computer Conferencing and Content Analysis. In Kaye, A. R. (Eds.), *Collaborative Learning Through Computer Conferencing: The Najaden papers*, 90, 117-136. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-77684-7_8
- Hew, K. F. (2016). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCs. *British Journal of Educational Technology*, 47(2), 320-341. <https://doi.org/10.1111/bjet.12235>
- Hew, K. F., Hu, X., Qiao, C., & Tang, Y. (2020). What predicts student satisfaction with MOOCs: A gradient boosting trees supervised machine learning and sentiment analysis approach. *Computers & Education*, 145, 103724.

- <https://doi.org/10.1016/j.compedu.2019.103724>
- Hilbe, J. M. (2011). *Negative binomial regression (2nd edition)*. Cambridge University Press.
- Hood, N., & Littlejohn, A. (2016a). MOOC Quality: the need for new measures. *Journal of Learning for Development*, 3(3), 28-42. <https://doi.org/10.56059/jl4d.v3i3.165>
- Hood, N., & Littlejohn, A. (2016b). Quality in MOOCs: Surveying the terrain. Commonwealth of Learning. Retrieved from https://oro.open.ac.uk/50931/1/2015_QualityinMOOCs-Surveying-the-Terrain.pdf
- Houston, S. L., Brady, K., Narasimham, G., & Fisher, D. (2017). Pass the idea please: The relationship between network position, direct engagement, and course performance in MOOCs. *Proceedings of the Fourth (2017) ACM Conference on Learning @ Scale*, 295-298. <https://doi.org/10.1145/3051457.3054008>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288. <https://doi.org/10.1177/1049732305276687>
- Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
- Hudson, L., Wolff, A., Gooch, D., Van Der Linden, J., Kortuem, G., Petre, M., ten Veen, R., & O'Connor-Gotra, S. (2019). Supporting urban change: Using a MOOC to facilitate attitudinal learning and participation in smart cities. *Computers & Education*, 129, 37-47. <https://doi.org/10.1016/j.compedu.2018.10.012>
- Huisman, B., Admiraal, W., Pilli, O., van de Ven, M., & Saab, N. (2018). Peer assessment in MOOCs: The relationship between peer reviewers' ability and authors' essay performance. *British Journal of Educational Technology*, 49(1), 101-110. <https://doi.org/10.1111/bjet.12520>
- Jansen, R. S., van Leeuwen, A., Janssen, J., Conijn, R., & Kester, L. (2020). Supporting learners' self-regulated learning in massive open online courses. *Computers & Education*, 146, 103771. <https://doi.org/10.1016/j.compedu.2019.103771>
- Jia, M., Gong, D., Luo, J., Zhao, J., Zheng, J., & Li, K. (2019). Who can benefit more from massive open online courses? A prospective cohort study. *Nurse education today*, 76, 96-102. <https://doi.org/10.1016/j.nedt.2019.02.004>
- Jiang, S., Fitzhugh, S. M., & Warschauer, M. (2014). Social positioning and performance in MOOCs. In *Workshop on Graph-Based Educational Data Mining*, 14. Retrieved from https://ceur-ws.org/Vol-1183/gedm_paper08.pdf
- Jiang, Y. (2025). Interaction and dialogue: Integration and application of artificial intelligence in blended mode writing feedback. *The Internet and Higher Education*, 100975. <https://doi.org/10.1016/j.iheduc.2024.100975>
- Joksimović, S., Manataki, A., Gašević, D., Dawson, S., Kovanović, V., & De Kereki, I. F. (2016, April 25-29). Translating network position into performance: Importance of centrality in different network configurations. *Proceedings of the Sixth International Conference on Learning Analytics & Knowledge*, 314-323. Edinburgh, United Kingdom. <https://doi.org/10.1145/2883851.2883928>

- Joksimović, S., Poquet, O., Kovanović, V., Dowell, N., Mills, C., Gašević, D., Dawson, S., Graesser, A. C., & Brooks, C. (2018). How do we model learning at scale? A systematic review of research on MOOCs. *Review of educational research*, 88(1), 43-86. <https://doi.org/10.3102/0034654317740335>
- Joo, Y. J., Lim, K. Y., & Kim, J. (2013). Locus of control, self-efficacy, and task value as predictors of learning outcome in an online university context. *Computers & Education*, 62, 149-158. <https://doi.org/10.1016/j.compedu.2012.10.027>
- Joo, Y. J., So, H. J., & Kim, N. H. (2018). Examination of relationships among students' self-determination, technology acceptance, satisfaction, and continuance intention to use K-MOOCs. *Computers & Education*, 122, 260-272. <https://doi.org/10.1016/j.compedu.2018.01.003>
- Jordan, K. (2015). Massive open online course completion rates revisited: Assessment, length and attrition. *International Review of Research in Open and Distributed Learning*, 16(3), 341-358. <https://doi.org/10.19173/irrodl.v16i3.2112>
- Jung, E., Kim, D., Yoon, M., Park, S., & Oakley, B. (2019). The influence of instructional design on learner control, sense of achievement, and perceived effectiveness in a supsize MOOC course. *Computers & Education*, 128, 377-388. <https://doi.org/10.1016/j.compedu.2018.10.001>
- Jung, I., & Lee, J. (2020). The effects of learner factors on MOOC learning outcomes and their pathways. *Innovations in Education and Teaching International*, 57(5), 565-576. <https://doi.org/10.1080/14703297.2019.1628800>
- Jung, Y., & Lee, J. (2018). Learning engagement and persistence in massive open online courses (MOOCs). *Computers & Education*, 122, 9-22. <https://doi.org/10.1016/j.compedu.2018.02.013>
- Kahan, T., Soffer, T., & Nachmias, R. (2017). Types of participant behavior in a massive open online course. *The International Review of Research in Open and Distributed Learning*, 18(6), 1-18. <https://doi.org/10.19173/irrodl.v18i6.3087>
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31-36. <https://doi.org/10.1007/BF02291575>
- Kang, I. G. (2020). Heterogeneity of learners' behavioral patterns of watching videos and completing assessments in massive open online courses (MOOCs): A latent class analysis. *International Review of Research in Open and Distributed Learning*, 21(4), 221-237. <https://doi.org/10.19173/irrodl.v21i4.4645>
- Khalil, M., & Ebner, M. (2017). Clustering patterns of engagement in massive open online courses (MOOCs): The use of learning analytics to reveal student categories. *Journal of computing in higher education*, 29(1), 114-132. <https://doi.org/10.1007/s12528-016-9126-9>
- Kim, E. (2023, March 18-20). Relevant interaction among learners and instructors in asynchronous academic writing course. *Proceedings of the 11th International Conference on Information and Education Technology (ICIET)*, 298-303. Fujisawa, Japan. <https://doi.org/10.1109/ICIET56899.2023.10111158>
- Kim, W., Watson, S. L., & Watson, W. R. (2016). Perceived learning in three MOOCs targeting attitudinal change. *Educational Media International*, 53(3), 168-183. <https://doi.org/10.1080/09523987.2016.1236890>

- Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2016, April 25-26). Recommending self-regulated learning strategies does not improve performance in a MOOC. *Proceedings of the Third (2016) ACM Conference on Learning @ Scale*, 101-104. Edinburgh, United Kindom. <https://doi.org/10.1145/2876034.2893378>
- Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education*, 104, 18-33. <https://doi.org/10.1016/j.compedu.2016.10.001>
- Kleinberg, J. M. (1999). Authoritative sources in a hyperlinked environment. *Journal of the ACM (JACM)*, 46(5), 604-632. <https://doi.org/10.1145/324133.324140>
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.
- Kormos, J., & Nijakowska, J. (2017). Inclusive practices in teaching students with dyslexia: Second language teachers' concerns, attitudes and self-efficacy beliefs on a massive open online learning course. *Teaching and Teacher Education*, 68, 30-41. <https://doi.org/10.1016/j.tate.2017.08.005>
- Kosovich, J. J., Flake, J. K., & Hulleman, C. S. (2017). Short-term motivation trajectories: A parallel process model of expectancy-value. *Contemporary Educational Psychology*, 49, 130-139. <https://doi.org/10.1016/j.cedpsych.2017.01.004>
- Kovanović, V., Joksimović, S., Poquet, O., Hennis, T., de Vries, P., Hatala, M., Dawson, S., Siemens, G., & Gašević, D. (2019). Examining communities of inquiry in massive open online courses: The role of study strategies. *The Internet and Higher Education*, 40, 20-43. <https://doi.org/10.1016/j.iheduc.2018.09.001>
- Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of applied psychology*, 78(2), 311-328. <https://psycnet.apa.org/doi/10.1037/0021-9010.78.2.311>
- Krasny, M. E., DuBois, B., Adameit, M., Atiogbe, R., Alfakihuddin, M. L. B., Bold-erdene, T., Golshani, Z., González-González, R., Kimirei, I., & Leung, Y. (2018). Small groups in a social learning MOOC (sIMOOC): Strategies for fostering learning and knowledge creation. *Online Learning*, 22(2), 119-139. <https://doi.org/10.24059/olj.v22i2.1339>
- Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). Taxonomy of educational objectives *Handbook II: Affective domain*,. David McKay Company.
- Kuo, T. M. L., Tsai, C. C., & Wang, J. C. (2021). Linking web-based learning self-efficacy and learning engagement in MOOCs: The role of online academic hardiness. *The Internet and Higher Education*, 100819. <https://doi.org/10.1016/j.iheduc.2021.100819>
- Kurucay, M. (2015). *Examining the effects of learner-learner interaction on students' perceptions of collaboration, sense of community, satisfaction, perceived learning and achievement in an online undergraduate course* (Doctoral dissertation, Texas Tech University). TTU Electronic Theses and Dissertations. <http://hdl.handle.net/2346/6362>
- Kurucay, M., & Inan, F. A. (2017). Examining the effects of learner-learner interactions on satisfaction and learning in an online undergraduate course. *Computers & Education*, 115, 20-37. <https://doi.org/10.1016/j.compedu.2017.06.010>
- Lambert, S. R. (2020). Do MOOCs contribute to student equity and social inclusion? A systematic review 2014-18. *Computers & Education*, 145, 103693. <https://doi.org/10.1016/j.compedu.2019.103693>

- Lan, M., & Hew, K. F. (2020). Examining learning engagement in MOOCs: A self-determination theoretical perspective using mixed method. *International Journal of Educational Technology in Higher Education*, 17(1), 1-24.
<https://doi.org/10.1186/s41239-020-0179-5>
- Lan, M., Hou, X., Qi, X., & Mattheos, N. (2019). Self-regulated learning strategies in world's first MOOC in implant dentistry. *European Journal of Dental Education*, 23(3), 278-285. <https://doi.org/10.1111/eje.12428>
- Lee, D., Watson, S. L., & Watson, W. R. (2020a). The influence of successful MOOC learners' self-regulated learning strategies, Self-efficacy, and task value on their perceived effectiveness of a massive open online course. *International Review of Research in Open and Distributed Learning*, 21(3), 81-98.
<https://doi.org/10.19173/irrodl.v21i3.4642>
- Lee, D., Watson, S. L., & Watson, W. R. (2020b). The relationships between self-efficacy, task value, and self-regulated learning strategies in massive open online courses. *International Review of Research in Open and Distributed Learning*, 21(1), 23-39.
<https://doi.org/10.19173/irrodl.v20i5.4389>
- Lee, Y. (2018). Effect of uninterrupted time-on-task on students' success in massive open online courses (MOOCs). *Computers in Human Behavior*, 86, 174-180.
<https://doi.org/10.1016/j.chb.2018.04.043>
- Lee, Y. (2019). Using self-organizing map and clustering to investigate problem-solving patterns in the massive open online course: an exploratory study. *Journal of Educational Computing Research*, 57(2), 471-490. <https://doi.org/10.1177/0735633117753364>
- Leenknecht, M. J., Wijnia, L., Loyens, S., & Rikers, R. (2017). Need-supportive teaching in higher education: Configurations of autonomy support, structure, and involvement. *Teaching and Teacher Education*, 68, 134-142.
<http://dx.doi.org/10.1016/j.tate.2017.08.020>
- Li, B., Wang, X., & Tan, S. C. (2018). What makes MOOC users persist in completing MOOCs? A perspective from network externalities and human factors. *Computers in Human Behavior*, 85, 385-395. <https://doi.org/10.1016/j.chb.2018.04.028>
- Li, H., Kim, M. K., & Xiong, Y. (2020). Individual learning vs. interactive learning: A cognitive diagnostic analysis of MOOC students' learning behaviors. *American Journal of distance education*, 34(2), 121-136. <https://doi.org/10.1080/08923647.2019.1697027>
- Li, K. (2019). MOOC learners' demographics, self-regulated learning strategy, perceived learning and satisfaction: A structural equation modeling approach. *Computers & Education*, 132, 16-30. <https://doi.org/10.1016/j.compedu.2019.01.003>
- Li, K., & Moore, D. R. (2018). Motivating students in massive open online courses (MOOCs) using the attention, relevance, confidence, satisfaction (ARCS) model. *Journal of Formative Design in Learning*, 2(2), 102-113.
<https://doi.org/10.1007/s41686-018-0021-9>
- Li, Q., & Baker, R. (2018). The different relationships between engagement and outcomes across participant subgroups in massive open online courses. *Computers & Education*, 127, 41-65. <https://doi.org/10.1016/j.compedu.2018.08.005>
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for

- reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Journal of clinical epidemiology*, 62(10), e1-e34. <https://doi.org/10.1136/bmj.b2700>
- Littenberg-Tobias, J., & Reich, J. (2020). Evaluating access, quality, and equity in online learning: A case study of a MOOC-based blended professional degree program. *The Internet and Higher Education*, 47, 100759. <https://doi.org/10.1016/j.iheduc.2020.100759>
- Littlejohn, A., Hood, N., Milligan, C., & Mustain, P. (2016). Learning in MOOCs: Motivations and self-regulated learning in MOOCs. *The Internet and Higher Education*, 29, 40-48. <https://doi.org/10.1016/j.iheduc.2015.12.003>
- Liu, Y., Zhang, M., Qi, D., & Zhang, Y. (2022). Understanding the role of learner engagement in determining MOOCs satisfaction: A self-determination theory perspective. *Interactive Learning Environments*, 1-15. <https://doi.org/10.1080/10494820.2022.2028853>
- Liu, Z., Tang, Q., Ouyang, F., Long, T., & Liu, S. (2024). Profiling students' learning engagement in MOOC discussions to identify learning achievement: An automated configurational approach. *Computers & Education*, 219, 105109. <https://doi.org/10.1016/j.compedu.2024.105109>
- Liu, Z., Zhang, N., Peng, X., Liu, S., Yang, Z., Peng, J., Su, Z., & Chen, J. (2022). Exploring the relationship between social interaction, cognitive processing and learning achievements in a MOOC discussion forum. *Journal of Educational Computing Research*, 60(1), 132-169. <https://doi.org/10.1177/07356331211027300>
- Loizzo, J., Ertmer, P. A., Watson, W. R., & Watson, S. L. (2017). Adult MOOC learners as self-directed: perceptions of motivation, success, and completion. *Online Learning*, 21(2), n2. <https://doi.org/10.24059/olj.v21i2.889>
- Loughlin, C., Lygo-Baker, S., & Lindberg-Sand, Å. (2021). Reclaiming constructive alignment. *European Journal of Higher Education*, 11(2), 119-136. <https://doi.org/10.1080/21568235.2020.1816197>
- Luik, P., Suviste, R., Lepp, M., Palts, T., Tõnisson, E., Säde, M., & Papli, K. (2019). What motivates enrolment in programming MOOCs? *British Journal of Educational Technology*, 50(1), 153-165. <https://doi.org/10.1111/bjet.12600>
- Luo, Y., Zhou, G., Li, J., & Xiao, X. (2018). Study on MOOC scoring algorithm based on Chinese university MOOC learning behavior data. *Heliyon*, 4(11), e00960. <https://doi.org/10.1016/j.heliyon.2018.e00960>
- Ma, L., & Lee, C. S. (2019). Understanding the barriers to the use of MOOCs in a developing country: An innovation resistance perspective. *Journal of Educational Computing Research*, 57(3), 571-590. <https://doi.org/10.1177/0735633118757732>
- Magen-Nagar, N., & Cohen, L. (2017). Learning strategies as a mediator for motivation and a sense of achievement among students who study in MOOCs. *Education and Information Technologies*, 22(3), 1271-1290. <https://doi.org/10.1007/s10639-016-9492-y>
- Maldonado-Mahauad, J., Pérez-Sanagustín, M., Kizilcec, R. F., Morales, N., & Munoz-Gama, J. (2018). Mining theory-based patterns from Big data: Identifying self-regulated

- learning strategies in massive open online courses. *Computers in Human Behavior*, 80, 179-196. <https://doi.org/10.1016/j.chb.2017.11.011>
- Margaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). *Computers & Education*, 80, 77-83. <https://doi.org/10.1016/j.compedu.2014.08.005>
- Margolis, H., & McCabe, P. P. (2003). Self-efficacy: A key to improving the motivation of struggling learners. *Preventing School Failure: Alternative Education for Children and Youth*, 47(4), 162-169. <https://doi.org/10.1080/10459880309603362>
- Maya-Jariego, I., Holgado, D., González-Tinoco, E., Castaño-Muñoz, J., & Punie, Y. (2020). Typology of motivation and learning intentions of users in MOOCs: The MOOCKNOWLEDGE study. *Educational Technology Research and Development*, 68(1), 203-224. <https://doi.org/10.1007/s11423-019-09682-3>
- Meek, S. E., Blakemore, L., & Marks, L. (2017). Is peer review an appropriate form of assessment in a MOOC? Student participation and performance in formative peer review. *Assessment & Evaluation in Higher Education*, 42(6), 1000-1013. <https://doi.org/10.1080/02602938.2016.1221052>
- Mendoza, N. B., Yan, Z., & King, R. B. (2023). Supporting students' intrinsic motivation for online learning tasks: The effect of need-supportive task instructions on motivation, self-assessment, and task performance. *Computers & Education*, 193, 104663. <https://doi.org/10.1016/j.compedu.2022.104663>
- Milligan, C., & Littlejohn, A. (2016). How health professionals regulate their learning in massive open online courses. *The Internet and Higher Education*, 31, 113-121. <https://doi.org/10.1016/j.iheduc.2016.07.005>
- Milligan, C., & Littlejohn, A. (2017). Why study on a MOOC? The motives of students and professionals. *International Review of Research in Open and Distributed Learning*, 18(2), 92-102. <https://doi.org/10.19173/irrodl.v18i2.3033>
- Min, H., & Nasir, M. (2020). Self-regulated learning in a massive open online course: A review of literature. *European Journal of Interactive Multimedia and Education*, 1(2), 1-6. <https://doi.org/10.30935/ejimed/8403>
- Min, L., & Foon, H. K. (2019, May 24-27). Self-regulated learning process in MOOCs: Examining the indicators of behavioral, emotional, and cognitive engagement. *Proceedings of the 2019 4th International Conference on Distance Education and Learning*, 99-105. Shanghai, China. <https://doi.org/10.1145/3338147.3338161>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Group, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS med*, 6(7), e1000097. <https://doi.org/10.1016/j.ijsu.2010.02.007>
- Najafi, H., Rolheiser, C., Håklev, S., & Harrison, L. (2017). Variations in pedagogical design of massive open online courses (MOOCs) across disciplines. *Teaching & Learning Inquiry*, 5(2), 47-64. <https://doi.org/10.20343/teachlearningqu.5.2.5>
- Najafi, H., Rolheiser, C., Harrison, L., & Heikoop, W. (2018). Connecting learner motivation to learner progress and completion in massive open online courses. *Canadian Journal of Learning and Technology*, 44(2). <https://doi.org/10.21432/cjlt27559>
- Narciss, S., Proske, A., & Koerndle, H. (2007). Promoting self-regulated learning in web-based learning environments. *Computers in Human Behavior*, 23(3), 1126-1144.

- <https://doi.org/10.1016/j.chb.2006.10.006>
- Nawrot, I., & Doucet, A. (2014, April 7-11). Building engagement for MOOC students: introducing support for time management on online learning platforms. *Proceedings of the 23rd International Conference on world wide web*, 1077-1082. Seoul, Korea.
<https://doi.org/10.1145/2567948.2580054>
- Nunnally, J. C. B. I. H. (1994). *Psychometric theory* (3rd edition). McGraw-Hill.
- Nuutila, K., Tuominen, H., Tapola, A., Vainikainen, M.-P., & Niemivirta, M. (2018). Consistency, longitudinal stability, and predictions of elementary school students' task interest, success expectancy, and performance in mathematics. *Learning and instruction*, 56, 73-83. <https://doi.org/10.1016/j.learninstruc.2018.04.003>
- O'brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & quantity*, 41(5), 673-690. <https://doi.org/10.1007/s11135-006-9018-6>
- OECD. (2020). The emergence of alternative credentials.
https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/03/the-emergence-of-alternative-credentials_48c4ea12/b741f39e-en.pdf
- Oh, C., Roumani, Y., Nwankpa, J. K., & Hu, H.-F. (2017). Beyond likes and tweets: Consumer engagement behavior and movie box office in social media. *Information & Management*, 54(1), 25-37. <https://doi.org/10.1016/j.im.2016.03.004>
- Oh, E. G., Chang, Y., & Park, S. W. (2020). Design review of MOOCs: Application of e-learning design principles. *Journal of computing in higher education*, 32(3), 455-475. <https://doi.org/10.1007/s12528-019-09243-w>
- Onah, D., & Sinclair, J. (2017). Assessing self-regulation of learning dimensions in a stand-alone MOOC platform. *International Journal of Engineering Pedagogy*, 7(2), 4-21. <https://doi.org/10.3991/ijep.v7i2.6511>
- Osborne, J. W., & Waters, E. (2002). Four assumptions of multiple regression that researchers should always test. *Practical assessment, research, and evaluation*, 8(1), 2. <https://doi.org/10.7275/r222-hv23>
- Otto, D., Caeiro, S., Nicolau, P., Disterheft, A., Teixeira, A., Becker, S., Bollmann, A., & Sander, K. (2019). Can MOOCs empower people to critically think about climate change? A learning outcome based comparison of two MOOCs. *Journal of Cleaner Production*, 222, 12-21. <https://doi.org/10.1016/j.jclepro.2019.02.190>
- Paechter, M., Maier, B., & Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & Education*, 54(1), 222-229. <https://doi.org/10.1016/j.compedu.2009.08.005>
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in psychology*, 8, 422. <https://doi.org/10.3389/fpsyg.2017.00422>
- Papathoma, T., Blake, C., Clow, D., & Scanlon, E. (2015). Investigating learners' views of assessment types in massive open online courses (MOOCs). In Conole, G., Klobučar, T., Rensing, C., Konert, J., Lavoué, E. (Eds), *Design for Teaching and Learning in a Networked World*, 617-621. Springer, Cham.
https://doi.org/10.1007/978-3-319-24258-3_72
- Pappano, L. (2012, November 2). The Year of the MOOC. *The New York Times*, 2(12).
<https://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html>

- Part, R., Perera, H. N., Marchand, G. C., & Bernacki, M. L. (2020). Revisiting the dimensionality of subjective task value: Towards clarification of competing perspectives. *Contemporary Educational Psychology*, 62, 101875. <https://doi.org/10.1016/j.cedpsych.2020.101875>
- Patterson, R. W. (2018). Can behavioral tools improve online student outcomes? Experimental evidence from a massive open online course. *Journal of Economic Behavior and Organization*, 153, 293-321. <https://doi.org/10.1016/j.jebo.2018.06.017>
- Perez, T., Dai, T., Kaplan, A., Cromley, J. G., Brooks, W. D., White, A. C., Mara, K. R., & Balsai, M. J. (2019). Interrelations among expectancies, task values, and perceived costs in undergraduate biology achievement. *Learning and Individual Differences*, 72, 26-38. <https://doi.org/10.1016/j.lindif.2019.04.001>
- Pertuz, S., Reyes, O., San Cristobal, E., Meier, R., & Castro, M. (2023). MOOC-based flipped classroom for on-campus teaching in undergraduate engineering courses. *IEEE Transactions on Education*, 66(5), 468-478. <https://doi.org/10.1109/TE.2023.3282896>
- Pilli, O., & Admiraal, W. (2016). A taxonomy of massive open online courses. *Contemporary Educational Technology*, 7(3), 223-240. Retrieved from <https://www.proquest.com/scholarly-journals/taxonomy-massive-open-online-courses/docview/2135157435/se-2>
- Pilli, O., & Admiraal, W. (2017). Students' learning outcomes in massive open online courses (MOOCs): Some suggestions for course design. *Journal of Higher Education/Yükseköğretim Dergisi*, 7(1). <https://doi.org/10.2399/yod.17.001>
- Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International journal of educational research*, 31(6), 459-470. [https://doi.org/10.1016/S0883-0355\(99\)00015-4](https://doi.org/10.1016/S0883-0355(99)00015-4)
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation*, 451-502. Academic Press. <https://doi.org/10.1016/B978-012109890-2/50043-3>
- Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of educational psychology*, 82(1), 33. <https://doi.org/10.1037/0022-0663.82.1.33>
- Pintrich, P. R., Smith, D. A. F., Garcia, T. a., & McKeachie, W. J. (1991). *A manual for the use of the motivated strategies for learning questionnaire (MSLQ)*. Ann Arbor, Michigan: University of Michigan, National Center for Research to Improve Postsecondary Teaching and Learning. Retrieved from <https://files.eric.ed.gov/fulltext/ED338122.pdf>
- Poquet, O., Jovanovic, J., & Dawson, S. (2020). Differences in forum communication of residents and visitors in MOOCs. *Computers & Education*, 156, 103937. <https://doi.org/10.1016/j.compedu.2020.103937>
- Poquet, O., Kovanović, V., de Vries, P., Hennis, T., Joksimović, S., Gašević, D., Dawson, S., Henderson, S., Conrad, D., & McGreal, R. (2018). Social presence in massive open online courses. *International Review of Research in Open and Distributed Learning*, 19(3). <https://doi.org/10.19173/irrodl.v19i3.3370>
- Post, L. S., Guo, P., Saab, N., & Admiraal, W. (2019). Effects of remote labs on cognitive, behavioral, and affective learning outcomes in higher education. *Computers & Education*, 140, 103596. <https://doi.org/10.1016/j.compedu.2019.103596>

- Pozón-López, I., Higuera-Castillo, E., Muñoz-Leiva, F., & Liébana-Cabanillas, F. J. (2021). Perceived user satisfaction and intention to use massive open online courses (MOOCs). *Journal of computing in higher education*, 33(1), 85-120. <https://doi.org/https://doi.org/10.1007/s12528-020-09257-9>
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, 40(3), 879-891. <https://doi.org/10.3758/BRM.40.3.879>
- Prior, D. D., Mazanov, J., Meacheam, D., Heaslip, G., & Hanson, J. (2016). Attitude, digital literacy and self efficacy: Flow-on effects for online learning behavior. *The Internet and Higher Education*, 29, 91-97. <https://doi.org/10.1016/j.iheduc.2016.01.001>
- Qiu, M., & Xu, Y. (2018). Assessing learning outcomes of a MOOC incorporated Into an on-Campus Management Information Systems Class. *Journal of International Technology and Information Management*, 27(1), 116-128. <https://doi.org/10.58729/1941-6679.1368>
- Rabbany, R., Elatia, S., Takaffoli, M., & Zañane, O. R. (2013). Collaborative learning of students in online discussion forums: A social network analysis perspective. In Peña-Ayala, A. (Eds.), *Educational data mining: Applications and trends*, 441-466. Springer, Cham. https://doi.org/10.1007/978-3-319-02738-8_16
- Rabin, E., Henderikx, M., Yoram, M. K., & Kalz, M. (2020). What are the barriers to learners' satisfaction in MOOCs and what predicts them? The role of age, intention, self-regulation, self-efficacy and motivation. *Australasian Journal of Educational Technology*, 36(3), 119-131. <https://doi.org/10.14742/ajet.5919>
- Rabin, E., Kalman, Y. M., & Kalz, M. (2019). An empirical investigation of the antecedents of learner-centered outcome measures in MOOCs. *International Journal of Educational Technology in Higher Education*, 16(1), 1-20. <https://doi.org/10.1186/s41239-019-0144-3>
- Raković, M., Marzouk, Z., Liaqat, A., Winne, P. H., & Nesbit, J. C. (2020). Fine grained analysis of students' online discussion posts. *Computers & Education*, 157, 103982. <https://doi.org/10.1016/j.compedu.2020.103982>
- Ramesh, A., Goldwasser, D., Huang, B., Daumé III, H., & Getoor, L. (2014, June 26). Understanding MOOC discussion forums using seeded LDA. *Proceedings of the Ninth Workshop on Innovative Use of NLP for Building Educational Applications*, 28-33. Baltimore, United States. Retrieved from <https://aclanthology.org/W14-1804.pdf>
- Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. *Journal of educational psychology*, 99(4), 734-746. <https://doi.org/10.1037/0022-0663.99.4.734>
- Rayyan, S., Fredericks, C., Colvin, K. F., Liu, A., Teodorescu, R., Barrantes, A., Pawl, A., Seaton, D. T., & Pritchard, D. E. (2016). A MOOC based on blended pedagogy. *Journal of Computer Assisted Learning*, 32(3), 190-201. <https://doi.org/10.1111/jcal.12126>
- Reeve, J., Cheon, S. H., & Yu, T. H. (2020). An autonomy-supportive intervention to develop students' resilience by boosting agentic engagement. *International Journal of Behavioral Development*, 44(4), 325-338. <https://doi.org/10.1177/0165025420911103>

- Reeve, J., & Tseng, C.-M. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology*, 36(4), 257-267. <https://doi.org/10.1016/j.cedpsych.2011.05.002>
- Reich, J., & Ruipérez-Valiente, J. A. (2019). The MOOC pivot. *Science*, 363(6423), 130-131. <https://doi.org/10.1126/science.aav7958>
- Rivera, D. A., Frenay, M., & Swaen, V. (2024). The learning design of MOOC discussion forums: An analysis of forum instructions and their role in supporting the social construction of knowledge. *Technology, Knowledge and Learning*, 29(2), 585-615. <https://doi.org/10.1007/s10758-023-09670-w>
- Rizvi, S., Rienties, B., Rogaten, J., & Kizilcec, R. F. (2019). Investigating Variation in Learning Processes in a FutureLearn MOOC. *Journal of computing in higher education*, 32(1), 162-181. <https://doi.org/10.1007/s12528-019-09231-0>
- Rodriguez, B. P., & Armellini, A. (2017). Developing self-efficacy through a massive open online course on study skills. *Open Praxis*, 9(3), 335-343. <https://doi.org/10.5944/openpraxis.9.3.659>
- Rose, C. E., Martin, S. W., Wannemuehler, K. A., & Plikaytis, B. D. (2006). On the use of zero-inflated and hurdle models for modeling vaccine adverse event count data. *Journal of biopharmaceutical statistics*, 16(4), 463-481. <https://doi.org/10.1080/10543400600719384>
- Rosé, C. P., Carlson, R., Yang, D., Wen, M., Resnick, L., Goldman, P., & Sherer, J. (2014, March 4-5). Social factors that contribute to attrition in MOOCs. *Proceedings of the first ACM conference on Learning @ scale conference*, 197-198. Atlanta, United States. <https://doi.org/10.1145/2556325.2567879>
- Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of personality*, 63(3), 397-427. <https://doi.org/10.1111/j.1467-6494.1995.tb00501.x>
- Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: examining reasons for acting in two domains. *Journal of personality and social psychology*, 57(5), 749-761. <https://psycnet.apa.org/doi/10.1037/0022-3514.57.5.749>
- Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54-67. <https://doi.org/10.1006/ceps.1999.1020>
- Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68-78. <https://doi.org/10.1037/110003-066X.55.1.68>
- Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research*, 2, 3-33. University of Rochester Press, New York. Retrieved from <https://www.elaborer.org/cours/A16/lectures/Ryan2004.pdf>
- Sa'don, N. F., Alias, R. A., & Ohshima, N. (2014, November 25-27). Nascent research trends in MOOCs in higher educational institutions: A systematic literature review. *Proceedings of the 2014 International Conference on Web and Open Access to Learning (ICWOAL)*, 1-4. Dubai, United Arab Emirates. <https://doi.org/10.1109/ICWOAL.2014.7009215>

- Sandeen, C. (2013). Assessment's place in the new MOOC world. *Research & practice in assessment*, 8, 5-12. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1062706.pdf>
- Santosa, P. I. (2015). Student engagement with online tutorial: A Perspective on Flow Theory. *International Journal of Emerging Technologies in Learning*, 10(1), 60-67. <http://dx.doi.org/10.3991/ijet.v10i1.4348>
- Sanz-Martínez, L., Er, E., Martínez-Monés, A., Dimitriadis, Y., & Bote-Lorenzo, M. L. (2019). Creating collaborative groups in a MOOC: a homogeneous engagement grouping approach. *Behaviour & Information Technology*, 38(11), 1107-1121. <https://doi.org/10.1080/0144929X.2019.1571109>
- Schrire, S. (2006). Knowledge building in asynchronous discussion groups: Going beyond quantitative analysis. *Computers & Education*, 46(1), 49-70. <https://doi.org/10.1016/j.compedu.2005.04.006>
- Schultz, B. B. (1985). Levene's test for relative variation. *Systematic Zoology*, 34(4), 449-456. <https://doi.org/10.1093/sysbio/34.4.449>
- Semenova, T. (2022). The role of learners' motivation in MOOC completion. *Open Learning: The Journal of Open, Distance and e-Learning*, 37(3), 273-287. <https://doi.org/10.1080/02680513.2020.1766434>
- Shapiro, H. B., Lee, C. H., Roth, N. E. W., Li, K., Çetinkaya-Rundel, M., & Canelas, D. A. (2017). Understanding the massive open online course (MOOC) student experience: An examination of attitudes, motivations, and barriers. *Computers & Education*, 110, 35-50. <https://doi.org/10.1016/j.compedu.2017.03.003>
- Shavelson, R. J., & Huang, L. (2003). Responding responsibly. *Change: The magazine of higher learning*, 35(1), 10-19. <https://doi.org/10.1080/00091380309604739>
- Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of educational research*, 56(4), 411-436. <https://doi.org/10.3102/00346543056004411>
- Sicilia, Á., Sáenz-Alvarez, P., González-Cutre, D., & Ferriz, R. (2015). Analysing the influence of autonomous and controlling social factors within the theory of planned behaviour. *Australian Psychologist*, 50(1), 70-79. <https://doi.org/10.1111/ap.12077>
- Simonson, M. R. (1979). Designing instruction for attitudinal outcomes. *Journal of instructional development*, 2(3), 15-19. <https://doi.org/10.1007/BF02984375>
- Singh, A. B., & Mørch, A. I. (2018). An analysis of participants' experiences from the first international MOOC offered at the University of Oslo. 13(01), 40-64. <https://doi.org/10.18261/issn.1891-943x-2018-01-04>
- Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of educational psychology*, 100(4), 765-781. <https://psycnet.apa.org/doi/10.1037/a0012840>
- Stamov Roßnagel, C., Fitzallen, N., & Lo Baido, K. (2021). Constructive alignment and the learning experience: relationships with student motivation and perceived learning demands. *Higher education research & development*, 40(4), 838-851. <https://doi.org/10.1080/07294360.2020.1787956>
- Stephens-Martinez, K., Hearst, M. A., & Fox, A. (2014, March 4-5). Monitoring moocs: which information sources do instructors value? *Proceedings of the first ACM conference on Learning @ scale conference*, 79-88. Atlanta, United States. <https://doi.org/10.1145/2556325.2566246>

- Stich, A. E., & Reeves, T. D. (2017). Massive open online courses and underserved students in the United States. *The Internet and Higher Education*, 32, 58-71.
<https://doi.org/10.1016/j.iheduc.2016.09.001>
- Strijbos, J. W., Martens, R. L., Prins, F. J., & Jochems, W. M. (2006). Content analysis: What are they talking about? *Computers & Education*, 46(1), 29-48.
<https://doi.org/10.1016/j.compedu.2005.04.002>
- Stroet, K., Opdenakker, M. C., & Minnaert, A. (2013). Effects of need supportive teaching on early adolescents' motivation and engagement: A review of the literature. *Educational Research Review*, 9, 65-87. <https://doi.org/10.1016/j.edurev.2012.11.003>
- Sun, G., & Bin, S. (2018). Topic interaction model based on local community detection in MOOC discussion forums and its teaching application. *Kuram ve Uygulamada Egitim Bilimleri*, 18(6), 2922-2931. <https://doi.org/10.12738/estp.2018.6.191>
- Sun, J. C. Y., & Rueda, R. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. *British Journal of Educational Technology*, 43(2), 191-204.
<https://doi.org/10.1111/j.1467-8535.2010.01157.x>
- Sun, Y., Ni, L., Zhao, Y., Shen, X. L., & Wang, N. (2019). Understanding students' engagement in MOOCs: An integration of self-determination theory and theory of relationship quality. *British Journal of Educational Technology*, 50(6), 3156-3174.
<https://doi.org/10.1111/bjet.12724>
- Sunar, A. S., Abbasi, R. A., Davis, H. C., White, S., & Aljohani, N. R. (2018). Modelling MOOC learners' social behaviours. *Computers in Human Behavior*, 107, 105835.
<https://doi.org/10.1016/j.chb.2018.12.013>
- Sunar, A. S., White, S., Abdullah, N. A., & Davis, H. C. (2016). How learners' interactions sustain engagement: A MOOC case study. *IEEE Transactions on Learning Technologies*, 10(4), 475-487. <https://doi.org/10.1109/TLT.2016.2633268>
- Swinnerton, B. J., Morris, N. P., Hotchkiss, S., & Pickering, J. D. (2017). The integration of an anatomy massive open online course (MOOC) into a medical anatomy curriculum. *Anatomical sciences education*, 10(1), 53-67. <https://doi.org/10.1002/ase.1625>
- Tang, C. M., & Chaw, L. (2019). Driving high inclination to complete massive open online courses (MOOCs): Motivation and engagement factors for learners. *Electronic Journal of E-learning*, 17, 118-130. <http://dx.doi.org/10.34190/JEL.17.2.05>
- Tang, H., Xing, W., & Pei, B. (2018). Exploring the temporal dimension of forum participation in MOOCs. *Distance Education*, 39(3), 353-372.
<https://doi.org/10.1080/01587919.2018.1476841>
- Taskin, Y., Hecking, T., Hoppe, H. U., Dimitrova, V., & Mitrovic, A. (2019). Characterizing comment types and levels of engagement in video-based learning as a basis for adaptive nudging. In Scheffel, M., Broisin, J., Pammer-Schindler, V., Ioannou, A., Schneider, J. (Eds.), *Transforming Learning with Meaningful Technologies*, 362-376. Springer, Cham. https://doi.org/10.1007/978-3-030-29736-7_27
- Tawfik, A. A., Reeves, T. D., Stich, A. E., Gill, A., Hong, C., McDade, J., Pillutla, V. S., Zhou, X., & Giabbanelli, P. J. (2017). The nature and level of learner-learner interaction in a chemistry massive open online course (MOOC). *Journal of computing in higher education*, 29, 411-431. <https://doi.org/10.1007/s12528-017-9135-3>

- Theil, H., & Nagar, A. (1961). Testing the independence of regression disturbances. *Journal of the American Statistical Association*, 56(296), 793-806.
<https://doi.org/10.1080/01621459.1961.10482126>
- Tobias, S., & Carlson, J. E. (1969). Brief report: Bartlett's test of sphericity and chance findings in factor analysis. *Multivariate behavioral research*, 4(3), 375-377.
https://doi.org/10.1207/s15327906mbr0403_8
- Torres, W. J., & Beier, M. E. (2018). Adult development in the wild: The determinants of autonomous learning in a massive open online course. *Learning and Individual Differences*, 65, 207-217. <https://doi.org/10.1016/j.lindif.2018.06.003>
- Tseng, H., Kuo, Y.-C., & Walsh, E. J. (2020). Exploring first-time online undergraduate and graduate students' growth mindsets and flexible thinking and their relations to online learning engagement. *Educational Technology Research and Development*, 68(5), 2285-2303. <https://doi.org/10.1007/s11423-020-09774-5>
- Tseng, S. F., Tsao, Y. W., Yu, L. C., Chan, C. L., & Lai, K. R. (2016). Who will pass? Analyzing learner behaviors in MOOCs. *Research and Practice in Technology Enhanced Learning*, 11(1), 1-11. <https://doi.org/10.1186/s41039-016-0033-5>
- Turk, M., Heddy, B. C., & Danielson, R. W. (2022). Teaching and social presences supporting basic needs satisfaction in online learning environments: How can presences and basic needs happily meet online? *Computers & Education*, 180, 104432.
<https://doi.org/10.1016/j.compedu.2022.104432>
- UNESCO. (2016). Education 2030: Incheon declaration and framework for action: Towards inclusive and equitable quality education and lifelong learning for all.
<https://unesdoc.unesco.org/ark:/48223/pf0000245656/Pdf/245656eng.pdf.multi>
- UNESCO & Commonwealth of Learning. (2016). Making sense of MOOCs: A guide for policy-makers in developing countries. <https://doi.org/10.54675/CKLG5881>
- Valdivia Vázquez, J. A., Ramírez-Montoya, M. S., Valenzuela González, J. R., Henderson, S., Conrad, D., McGreal, R., & Kennepohl, D. (2018). Motivation and knowledge: Pre-assessment and post-assessment of MOOC participants from an Energy and Sustainability Project. *International Review of Research in Open and Distributed Learning*, 19(4), 116-132. <https://doi.org/10.19173/irrodl.v19i4.3489>
- van de Oudeweetering, K., & Agirdag, O. (2018). Demographic data of MOOC learners: Can alternative survey deliveries improve current understandings? *Computers & Education*, 122, 169-178. <https://doi.org/10.1016/j.compedu.2018.03.017>
- van den Beemt, A., Buijs, J., van der Aalst, W., Henderson, S., Conrad, D., McGreal, R., & Kennepohl, D. (2018). Analysing structured learning behaviour in massive open online courses (MOOCs): An approach based on process mining and clustering. *International Review of Research in Open and Distributed Learning*, 19(5).
<https://doi.org/10.19173/irrodl.v19i5.3748>
- Vansteenkiste, M., Sierens, E., Soenens, B., Luyckx, K., & Lens, W. (2009). Motivational profiles from a self-determination perspective: The quality of motivation matters. *Journal of educational psychology*, 101(3), 671-688.
<https://psycnet.apa.org/doi/10.1037/a0015083>

- Vayre, E., & Vonthron, A. M. (2017). Psychological engagement of students in distance and online learning: Effects of self-efficacy and psychosocial processes. *Journal of Educational Computing Research*, 55(2), 197-218.
<https://doi.org/10.1177/0735633116656849>
- Vayre, E., & Vonthron, A. M. (2019). Relational and psychological factors affecting exam participation and student achievement in online college courses. *The Internet and Higher Education*, 43, 100671. <https://doi.org/10.1016/j.iheduc.2018.07.001>
- Vellukunnel, M., Buffum, P., Boyer, K. E., Forbes, J., Heckman, S., & Mayer-Patel, K. (2017, March 8-11). Deconstructing the discussion forum: Student questions and computer science learning. *Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education*, 603-608. Seattle, United States.
<https://doi.org/10.1145/3017680.3017745>
- Vera, M. d. M. S., Calatayud, V. G., & Espinosa, M. P. P. (2017). Los MOOC y la evaluación del alumnado: revisión sistemática (2012-2016). *@ tic. revista d'innovació educativa*(18), 65. <https://doi.org/10.7203/ATTIC.18.10013>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning and individual differences*, 16(1), 1-12.
<https://doi.org/10.1016/j.lindif.2005.06.004>
- Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), 302-323. <https://doi.org/10.1080/01587919.2013.835779>
- Wang, L., Hu, G., & Zhou, T. (2018). Semantic analysis of learners' emotional tendencies on online MOOC education. *Sustainability*, 10(6), 1921.
<https://doi.org/10.3390/su10061921>
- Wang, W., Guo, L., He, L., & Wu, Y. J. (2019). Effects of social-interactive engagement on the dropout ratio in online learning: insights from MOOC. *Behaviour & Information Technology*, 38(6), 621-636. <https://doi.org/10.1080/0144929X.2018.1549595>
- Wang, X., Su, Y., Cheung, S., Wong, E., & Kwong, T. (2013). An exploration of Biggs' constructive alignment in course design and its impact on students' learning approaches. *Assessment & Evaluation in Higher Education*, 38(4), 477-491.
<https://doi.org/10.1080/02602938.2012.658018>
- Wang, X., Wen, M., & Rosé, C. P. (2016, April 25-29). Towards triggering higher-order thinking behaviors in MOOCs. *Proceedings of the Sixth International Conference on Learning Analytics & Knowledge*, 398-407. Edinburgh, United Kingdom.
<https://doi.org/10.1145/2883851.2883964>
- Wang, X., Yang, D., Wen, M., Koedinger, K., & Rosé, C. P. (2015, June 26-29). Investigating how student's cognitive behavior in MOOC discussion forums affect learning gains. *Proceedings of the 8th International Conference on Educational Data Mining*, 226-233. Madrid, Spain. Retrieved from <https://files.eric.ed.gov/fulltext/ED560568.pdf>
- Wang, Z., Anderson, T., Chen, L., Henderson, S., Conrad, D., & McGreal, R. (2018). How learners participate in connectivist learning: An analysis of the interaction traces from a

- cMOOC. *International Review of Research in Open and Distributed Learning*, 19(1). <https://doi.org/10.19173/irrodl.v19i1.3269>
- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge University Press.
- Watson, S. L., Watson, W. R., Yu, J. H., Alamri, H., & Mueller, C. (2017). Learner profiles of attitudinal learning in a MOOC: An explanatory sequential mixed methods study. *Computers & Education*, 114, 274-285. <https://doi.org/10.1016/j.compedu.2017.07.005>
- Watted, A., & Barak, M. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. *The Internet and Higher Education*, 37, 11-20. <https://doi.org/10.1016/j.iheduc.2017.12.001>
- Wei, W., Liu, J., Xu, X., Kolletar-Zhu, K., & Zhang, Y. (2023). Effective interactive engagement strategies for MOOC forum discussion: A self-efficacy perspective. *Plos one*, 18(11), e0293668. <https://doi.org/10.1371/journal.pone.0293668>
- Wei, X., Saab, N., & Admiraal, W. (2021). Assessment of cognitive, behavioral, and affective learning outcomes in massive open online courses: A systematic literature review. *Computers & Education*, 163, 104097. <https://doi.org/10.1016/j.compedu.2020.104097>
- Wei, X., Saab, N., & Admiraal, W. (2023). Do learners share the same perceived learning outcomes in MOOCs? Identifying the role of motivation, perceived learning support, learning engagement, and self-regulated learning strategies. *The Internet and Higher Education*, 56, 100880. <https://doi.org/10.1016/j.iheduc.2022.100880>
- Wei, X., Saab, N., & Admiraal, W. (2024). What rationale would work? Unfolding the role of learners' attitudes and motivation in predicting learning engagement and perceived learning outcomes in MOOCs. *International Journal of Educational Technology in Higher Education*, 21(1), 5. <https://doi.org/10.1186/s41239-023-00433-2>
- Wekerle, C., Daumiller, M., Janke, S., Dickhäuser, O., Dresel, M., & Kollar, I. (2024). Putting ICAP to the test: how technology-enhanced learning activities are related to cognitive and affective-motivational learning outcomes in higher education. *Scientific Reports*, 14(1), 16295. <https://doi.org/10.1038/s41598-024-66069-y>
- Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental review*, 30(1), 1-35. <https://doi.org/10.1016/j.dr.2009.12.001>
- Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, 25(1), 68-81. <https://doi.org/10.1006/ceps.1999.1015>
- Williams, K. M., Stafford, R. E., Corliss, S. B., & Reilly, E. D. (2018). Examining student characteristics, goals, and engagement in massive open online courses. *Computers & Education*, 126, 433-442. <https://doi.org/10.1016/j.compedu.2018.08.014>
- Williams, R. T. (2024). An overview of MOOCs and blended learning: integrating MOOC technologies into traditional classes. *IETE Journal of Education*, 65(2), 84-91. <https://doi.org/10.1080/09747338.2024.2303040>
- Wise, A. F., & Cui, Y. (2018, March 7-9). Unpacking the relationship between discussion forum participation and learning in MOOCs: Content is key. *Proceedings of the 8th International Conference on Learning Analytics and Knowledge*, 330-339. Sydney, Australia. <https://doi.org/10.1145/3170358.3170403>

- Wong, J., Baars, M., Davis, D., Van Der Zee, T., Houben, G. J., & Paas, F. (2019). Supporting self-regulated learning in online learning environments and MOOCs: A systematic review. *International Journal of Human-Computer Interaction*, 35(4-5), 356-373. <https://doi.org/10.1080/10447318.2018.1543084>
- Wong, J., Khalil, M., Baars, M., de Koning, B. B., & Paas, F. (2019). Exploring sequences of learner activities in relation to self-regulated learning in a massive open online course. *Computers & Education*, 140, 103595. <https://doi.org/10.1016/j.compedu.2019.103595>
- Woo, Y., & Reeves, T. C. (2007). Meaningful interaction in web-based learning: A social constructivist interpretation. *The Internet and Higher Education*, 10(1), 15-25. <https://doi.org/10.1016/j.iheduc.2006.10.005>
- Wu, B., & Chen, X. (2017). Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. *Computers in Human Behavior*, 67, 221-232. <https://doi.org/10.1016/j.chb.2016.10.028>
- Wu, W. H., Kao, H. Y., Wu, S. H., & Wei, C. W. (2019). Development and evaluation of affective domain using Student's feedback in entrepreneurial MOOC courses. *Frontiers in psychology*, 10, 1109. <https://doi.org/10.3389/fpsyg.2019.01109>
- Xing, W. (2019). Exploring the influences of MOOC design features on student performance and persistence. *Distance Education*, 40(1), 98-113. <https://doi.org/10.1080/01587919.2018.1553560>
- Xiong, Y., & Suen, H. K. (2018). Assessment approaches in massive open online courses: Possibilities, challenges and future directions. *International Review of Education*, 64(2), 241-263. <https://doi.org/10.1007/s11159-018-9710-5>
- Yang, D., Sinha, T., Adamson, D., & Rosé, C. P. (2013, December). Turn on, tune in, drop out: Anticipating student dropouts in massive open online courses. *Proceedings of the 2013 NIPS Data-driven education workshop*, 11, 14. Lake Tahoe, Nevada, United States. Retrieved from <https://www-cs.stanford.edu/~diyiy/docs/nips13.pdf>
- Yang, H. H., & Su, C. H. (2017). Learner behaviour in a MOOC practice-oriented course: in empirical study integrating TAM and TPB. *The International Review of Research in Open and Distributed Learning*, 18(5), 35-63. <https://doi.org/10.19173/irrodl.v18i5.2991>
- Yang, Q. (2014). Students motivation in asynchronous online discussions with MOOC mode. *American Journal of Educational Research*, 2(5), 325-330. <https://doi.org/10.12691/education-2-5-1>
- Yau, K. K., Wang, K., & Lee, A. H. (2003). Zero-inflated negative binomial mixed regression modeling of over-dispersed count data with extra zeros. *Biometrical Journal: journal of mathematical methods in biosciences*, 45(4), 437-452. <https://doi.org/10.1002/bimj.200390024>
- Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M. (2014, July 7-10). What drives a successful MOOC? An empirical examination of criteria to assure design quality of MOOCs. *2014 IEEE 14th International Conference on Advanced Learning Technologies*, 44-48. Athens, Greece. <https://doi.org/10.1109/ICALT.2014.23>
- Yu, A. Y., Tian, S. W., Vogel, D., & Kwok, R. C.-W. (2010). Can learning be virtually boosted? An investigation of online social networking impacts. *Computers & Education*, 55(4), 1494-1503. <https://doi.org/10.1016/j.compedu.2010.06.015>

- Yuan, L., Powell, S., & Olivier, B. (2014). Beyond MOOCs: Sustainable online learning in institutions. <https://publications.cetis.org.uk/wp-content/uploads/2014/01/Beyond-MOOCs-Sustainable-Online-Learning-in-Institutions.pdf>
- Yurdabakan, I. (2016). The investigation of the prospective teachers' opinions related to peer assessment: A qualitative study. *Online Submission*, 7(4), 1-12. Retrieved from <https://files.eric.ed.gov/fulltext/ED581695.pdf>
- Zainab, B., Awais Bhatti, M., & Alshagawi, M. (2017). Factors affecting e-training adoption: An examination of perceived cost, computer self-efficacy and the technology acceptance model. *Behaviour & Information Technology*, 36(12), 1261-1273. <https://doi.org/10.1080/0144929X.2017.1380703>
- Zhang, S., & Liu, Q. (2019). Investigating the relationships among teachers' motivational beliefs, motivational regulation, and their learning engagement in online professional learning communities. *Computers & Education*, 134, 145-155. <https://doi.org/10.1016/j.compedu.2019.02.013>
- Zheng, S., Rosson, M. B., Shih, P. C., & Carroll, J. M. (2015, March 14-18). Understanding student motivation, behaviors and perceptions in MOOCs. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1882-1895. Vancouver, Canada. <https://doi.org/10.1145/2675133.2675217>
- Zhou, M. (2016). Chinese university students' acceptance of MOOCs: A self-determination perspective. *Computers & Education*, 92, 194-203. <https://doi.org/10.1016/j.compedu.2015.10.012>
- Zhu, M., Sari, A., & Lee, M. M. (2018). A systematic review of research methods and topics of the empirical MOOC literature (2014-2016). *The Internet and Higher Education*, 37, 31-39. <https://doi.org/10.1016/j.iheduc.2018.01.002>
- Zielinski, M., West, V., Merzdorf, H. E., Douglas, K. A., & Bermel, P. (2019). Motivation and perceived costs to achievement in advanced moocs: a mixed method study of advanced engineering mooc engineering learners' motivation and perceived barriers. *The International journal of engineering education*, 35(5), 1540-1550. Retrieved from https://www.ijee.ie/latestissues/Vol35-5/26_ijee3818.pdf
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82-91. <https://doi.org/10.1006/ceps.1999.1016>
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, 41(2), 64-70. https://doi.org/10.1207/s15430421tip4102_2
- Zuur, A. F., Saveliev, A. A., & Ieno, E. N. (2012). *Zero inflated models and generalized linear mixed models with R*. Highland Statistics Limited.

Appendices



Appendix A. References of studies included in the systematic literature review

- *Almeda, M. V., Zuech, J., Baker, R. S., Utz, C., Higgins, G., & Reynolds, R. (2018). Comparing the factors that predict completion and grades among for-credit and open/MOOC students in online learning. *Online Learning*, 22(1), 1-18.
Retrieved from: <https://www.learntechlib.org/p/189536/>.
- *Balint, T. A., Teodorescu, R., Colvin, K., Choi, Y. J., & Pritchard, D. (2017). Physics instructional resource usage by high-, medium-, and low-skilled MOOC students. *The Physics Teacher*, 55(4), 222-225. <https://doi.org/10.1119/1.4978719>
- *Bonafini, F. C. (2017). The effects of participants' engagement with videos and forums in a MOOC for teachers' professional development. *Open Praxis*, 9(4), 433-447.
<https://doi.org/10.5944/openpraxis.9.4.637>
- *Bonafini, F. C., Chae, C., Park, E., & Jablokow, K. (2017). How much does student engagement with videos and forums in a MOOC affect their achievement? *Online Learning Journal*, 21(4), 223-240.
Retrieved from <https://www.learntechlib.org/p/183772/>.
- *Buhr, E. E., Daniels, L. M., & Goegan, L. D. (2019). Cognitive appraisals mediate relationships between two basic psychological needs and emotions in a massive open online course. *Computers in Human Behavior*, 96, 85-94.
<https://doi.org/10.1016/j.chb.2019.02.009>
- *Chang, J. J., Lin, W. S., & Chen, H. R. (2019). How attention level and cognitive style affect learning in a MOOC environment? Based on the perspective of brainwave analysis. *Computers in Human Behavior*, 100, 209-217.
<https://doi.org/10.1016/j.chb.2018.08.016>
- *Chiu, T. K. F., & Hew, T. K. F. (2018). Factors influencing peer learning and performance in MOOC asynchronous online discussion forum. *Australasian Journal of Educational Technology*, 34(4), 16. <https://doi.org/10.14742/ajet.3240>
- *Comer, D. (2017). Learning transfer, feedback, and massive open online courses. *Journal of Systemics, Cybernetics and Informatics*, 15(1), 44-52.
Retrieved from: [http://www.iiisci.org/Journal/CV\\$/sci/pdfs/SA611XH16.pdf](http://www.iiisci.org/Journal/CV$/sci/pdfs/SA611XH16.pdf)
- *Conijn, R., Van Den Beemt, A., & Cuijpers, P. (2018). Predicting student performance in a blended MOOC. *Journal of Computer Assisted Learning*, 34(5), 615-628.
<https://doi.org/10.1111/jcal.12270>
- *DeBoer, J., Haney, C., Atiq, S. Z., Smith, C., & Cox, D. (2019). Hands-on engagement online: Using a randomised control trial to estimate the impact of an at-home lab kit on student attitudes and achievement in a MOOC. *European Journal of Engineering Education*, 44(1-2), 234-252. <https://doi.org/10.1080/03043797.2017.1378170>
- *de Lima, M., & Zorrilla, M. E. (2017). Social networks and the building of learning communities: An experimental study of a social MOOC. *International Review of Research in Open and Distributed Learning*, 18(1), 40-64.
<https://doi.org/10.19173/irrodl.v18i1.2630>

- *Duan, J., Xie, K., Hawk, N. A., Yu, S., & Wang, M. (2019). Exploring a personal social knowledge network (PSKN) to aid the observation of connectivist interaction for high- and low-performing learners in connectivist massive open online courses. *British Journal of Educational Technology*, 50(1), 199-217. <https://doi.org/10.1111/bjet.12687>
- *Eccleston, C., Doherty, K., Bindoff, A., Robinson, A., Vickers, J., & McInerney, F. (2019). Building dementia knowledge globally through the understanding dementia Massive Open Online Course (MOOC). *npj Science of Learning*, 4(1), 1-6. <https://doi.org/10.1038/s41539-019-0042-4>
- *Emanuel, J. P., & Lamb, A. (2017). Open, online, and blended: Transactional interactions with MOOC content by learners in three different course formats. *Online Learning*, 21(2). <https://dx.doi.org/10.2139/ssrn.2666657>
- *Formanek, M., Wenger, M. C., Buxner, S. R., Impey, C. D., & Sonam, T. (2017). Insights about large-scale online peer assessment from an analysis of an astronomy MOOC. *Computers & Education*, 113, 243-262. <https://doi.org/10.1016/j.compedu.2017.05.019>
- *Harvey, L. A., Glinsky, J. V., Muldoon, S., & Chhabra, H. S. (2017). Massive open online courses for educating physiotherapists about spinal cord injuries: a descriptive study. *Spinal Cord Series and Cases*, 3, 17005. <https://doi.org/10.1038/scsanc.2017.5>
- *Hudson, L., Wolff, A., Gooch, D., Van Der Linden, J., Kortuem, G. W., Petre, M., & O'Connor-Gotra, S. (2019). Supporting urban change: Using a MOOC to facilitate attitudinal learning and participation in smart cities. *Computers & Education*, 129, 37-47. <https://doi.org/10.1016/j.compedu.2018.10.012>
- *Jia, M., Gong, D., Luo, J., Zhao, J., Zheng, J., & Li, K. (2019). Who can benefit more from massive open online courses? A prospective cohort study. *Nurse education today*, 76, 96-102. <https://doi.org/10.1016/j.nedt.2019.02.004>
- *Jung, E., Kim, D., Yoon, M., Park, S., & Oakley, B. (2019). The influence of instructional design on learner control, sense of achievement, and perceived effectiveness in a supersize MOOC course. *Computers & Education*, 128, 377-388. <https://doi.org/10.1016/j.compedu.2018.10.001>
- *Jung, Y., & Lee, J. (2018). Learning engagement and persistence in massive open online courses (MOOCs). *Computers & Education*, 122, 9-22. <https://doi.org/10.1016/j.compedu.2018.02.013>
- *Kahan, T., Soffer, T., & Nachmias, R. (2017). Types of participant behavior in a massive open online course. *The International Review of Research in Open and Distributed Learning*, 18(6), 1-18. <https://doi.org/10.19173/irrodl.v18i6.3087>
- *Khalil, M., & Ebner, M. (2017). Clustering patterns of engagement in massive open online courses (MOOCs): The use of learning analytics to reveal student categories. *Journal of Computing in Higher Education*, 29(1), 114-132. <https://doi.org/10.1007/s12528-016-9126-9>
- *Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education*, 104, 18-33. <https://doi.org/10.1016/j.compedu.2016.10.001>
- *Kormos, J., & Nijakowska, J. (2017). Inclusive practices in teaching students with dyslexia: Second language teachers' concerns, attitudes and self-efficacy beliefs on a massive open online learning course. *Teaching and Teacher Education*, 68, 30-41.

- <https://doi.org/10.1016/j.tate.2017.08.005>
- *Kovanović, V., Joksimović, S., Poquet, O., Hennis, T., de Vries, P., Hatala, M., & Gašević, D. (2019). Examining communities of inquiry in massive open online courses: The role of study strategies. *The Internet and Higher Education*, 40, 20-43.
<https://doi.org/10.1016/j.iheduc.2018.09.001>
- *Krasny, M. E., DuBois, B., Adameit, M., Atiogbe, R., Alfakihuddin, M. L. B., Bold-erdene, T., & Leung, Y. (2018). Small groups in a social learning MOOC (sIMOOC): Strategies for fostering learning and knowledge creation. *Online Learning*, 22(2), 119-139.
Retrieved from: <https://files.eric.ed.gov/fulltext/EJ1181445.pdf>
- *Lan, M., Hou, X., Qi, X., & Mattheos, N. (2019). Self-regulated learning strategies in world's first MOOC in implant dentistry. *European Journal of Dental Education*, 23(3), 278-285. <https://doi.org/10.1111/eje.12428>
- *Lee, Y. (2018). Effect of uninterrupted time-on-task on students' success in massive open online courses (MOOCs). *Computers in Human Behavior*, 86, 174-180.
<https://doi.org/10.1016/j.chb.2018.04.043>
- *Lee, Y. (2019). Using self-organizing map and clustering to investigate problem-solving patterns in the massive open online course: An exploratory study. *Journal of Educational Computing Research*, 57(2), 471-490.
<https://doi.org/10.1177/0735633117753364>
- *Li, B., Wang, X., & Tan, S. C. (2018). What makes MOOC users persist in completing MOOCs? A perspective from network externalities and human factors. *Computers in Human Behavior*, 85, 385-395. <https://doi.org/10.1016/j.chb.2018.04.028>
- *Li, K. (2019). MOOC learners' demographics, self-regulated learning strategy, perceived learning and satisfaction: A structural equation modeling approach. *Computers & Education*, 132, 16-30. <https://doi.org/10.1016/j.compedu.2019.01.003>
- *Li, K., & Moore, D. R. (2018). Motivating students in massive open online courses (MOOCs) using the attention, relevance, confidence, satisfaction (ARCS) model. *Journal of Formative Design in Learning*, 2(2), 102-113. <https://doi.org/10.1007/s41686-018-0021-9>
- *Li, Q., & Baker, R. (2018). The different relationships between engagement and outcomes across participant subgroups in massive open online courses. *Computers & Education*, 127, 41-65. <https://doi.org/10.1016/j.compedu.2018.08.005>
- *Loizzo, J., Ertmer, P. A., Watson, W. R., & Watson, S. L. (2017). Adult MOOC learners as self-directed: Perceptions of motivation, success, and completion. *Online Learning*, 21(2). <http://dx.doi.org/10.24059/olj.v21i2.889>
- *Luo, Y., Zhou, G., Li, J., & Xiao, X. (2018). Study on MOOC scoring algorithm based on Chinese University MOOC learning behavior data. *Heliyon*, 4(11), e00960.
<https://doi.org/10.1016/j.heliyon.2018.e00960>
- *Maldonado-Mahauad, J., Pérez-Sanagustín, M., Kizilcec, R. F., Morales, N., & Munoz-Gama, J. (2018). Mining theory-based patterns from big data: Identifying self-regulated learning strategies in massive open online courses. *Computers in Human Behavior*, 80, 179-196. <https://doi.org/10.1016/j.chb.2017.11.011>

- *Meek, S. E., Blakemore, L., & Marks, L. (2017). Is peer review an appropriate form of assessment in a MOOC? Student participation and performance in formative peer review. *Assessment & Evaluation in Higher Education*, 42(6), 1000-1013. <https://doi.org/10.1080/02602938.2016.1221052>
- *Moreno-Marcos, P. M., Muñoz-Merino, P. J., Alario-Hoyos, C., Estévez-Ayres, I., & Delgado Kloos, C. (2018). Analysing the predictive power for anticipating assignment grades in a massive open online course. *Behaviour & Information Technology*, 37(10-11), 1021-1036. <https://doi.org/10.1080/0144929X.2018.1458904>
- *Najafi, H., Rolheiser, C., Håklev, S., & Harrison, L. (2017). Variations in pedagogical design of massive open online courses (MOOCs) across disciplines. *Teaching & Learning Inquiry*, 5(2), 47-64. <https://doi.org/10.20343/teachlearninqu.5.2.5>
- *Najafi, H., Rolheiser, C., Harrison, L., & Heikoop, W. (2018). Connecting learner motivation to learner progress and completion in massive open online courses. *Canadian Journal of Learning and Technology*, 44(2). <https://doi.org/10.21432/cjlt27559>
- *Onah, D., & Sinclair, J. (2017). Assessing self-regulation of learning dimensions in a stand-alone MOOC platform. *International Journal of Engineering Pedagogy*, 7(2), 4-21. <https://www.learntechlib.org/p/207403/>.
- *Patterson, R. W. (2018). Can behavioral tools improve online student outcomes? Experimental evidence from a massive open online course. *Journal of Economic Behavior & Organization*, 153, 293-321. <https://doi.org/10.1016/j.jebo.2018.06.017>
- *Poquet, O., Kovanović, V., de Vries, P., Hennis, T., Joksimović, S., Gašević, D., & Dawson, S. (2018). Social presence in massive open online courses. *International Review of Research in Open and Distributed Learning*, 19(3). <https://doi.org/10.19173/irrodl.v19i3.3370>
- *Qiu, M., & Xu, Y. (2018). Assessing learning outcomes of a MOOC incorporated into an on-campus management information systems class. *Journal of International Technology and Information Management*, 27(1), 116-128. <https://doi.org/10.58729/1941-6679.1368>
- *Rabin, E., Kalman, Y. M., & Kalz, M. (2019). An empirical investigation of the antecedents of learner-centered outcome measures in MOOCs. *International Journal of Educational Technology in Higher Education*, 16(1), 14. <https://doi.org/10.1186/s41239-019-0144-3>
- *Rizvi, S., Rienties, B., Rogaten, J., & Kizilcec, R. F. (2019). Investigating variation in learning processes in a FutureLearn MOOC. *Journal of computing in higher education*, 32(1), 162-181. <https://doi.org/10.1007/s12528-019-09231-0>
- *Rodriguez, B. P., & Armellini, A. (2017). Developing self-efficacy through a massive open online course on study skills. *Open Praxis*, 9(3), 335-343. <https://doi.org/10.5944/openpraxis.9.3.659>
- *Shapiro, H. B., Lee, C. H., Roth, N. E. W., Li, K., Çetinkaya-Rundel, M., & Canelas, D. A. (2017). Understanding the massive open online course (MOOC) student experience: An examination of attitudes, motivations, and barriers. *Computers & Education*, 110, 35-50. <https://doi.org/10.1016/j.compedu.2017.03.003>

- *Singh, A. B., & Mørch, A. I. (2018). An analysis of participants' experiences from the first international MOOC offered at the University of Oslo. *Nordic Journal of Digital Literacy*, 13(01), 40-64. <https://doi.org/10.18261/issn.1891-943x-2018-01-04>
- *Stich, A. E., & Reeves, T. D. (2017). Massive open online courses and underserved students in the United States. *The Internet and Higher Education*, 32, 58-71. <https://doi.org/10.1016/j.iheduc.2016.09.001>
- *Sun, G., & Bin, S. (2018). Topic interaction model based on local community detection in MOOC discussion forums and it's teaching application. *Kuram ve Uygulamada Egitim Bilimleri*, 18(6), 2922-2931. <https://doi.org/10.12738/estp.2018.6.191>
- *Sunar, A. S., Abbasi, R. A., Davis, H. C., White, S., & Aljohani, N. R. (2018). Modelling MOOC learners' social behaviours. *Computers in Human Behavior*, 105835. <https://doi.org/10.1016/j.chb.2018.12.013>
- *Swinnerton, B. J., Morris, N. P., Hotchkiss, S., & Pickering, J. D. (2017). The integration of an anatomy massive open online course (MOOC) into a medical anatomy curriculum. *Anatomical Sciences Education*, 10(1), 53-67. <https://doi.org/10.1002/ase.1625>
- *Torres, W. J., & Beier, M. E. (2018). Adult development in the wild: The determinants of autonomous learning in a massive open online course. *Learning and Individual Differences*, 65, 207-217. <https://doi.org/10.1016/j.lindif.2018.06.003>
- *Valdivia Vázquez, J. A., Ramírez-Montoya, M. S., Valenzuela González, J. R., Henderson, S., Conrad, D., McGreal, R., & Kennepohl, D. (2018). Motivation and knowledge: Pre-assessment and post-assessment of MOOC participants from an energy and sustainability project. *International Review of Research in Open and Distributed Learning*, 19(4), 116-132. <https://doi.org/10.19173/irrodl.v19i4.3489>
- *van den Beemt, A., Buijs, J., van der Aalst, W., Henderson, S., Conrad, D., McGreal, R., & Kennepohl, D. (2018). Analysing structured learning behaviour in massive open online courses (MOOCs): An approach based on process mining and clustering. *International Review of Research in Open and Distributed Learning*, 19(5). <https://doi.org/10.19173/irrodl.v19i5.3748>
- *van de Oudeweetering, K., & Agirdag, O. (2018). Demographic data of MOOC learners: Can alternative survey deliveries improve current understandings? *Computers & Education*, 122, 169-178. <https://doi.org/10.1016/j.compedu.2018.03.017>
- *Wang, L., Hu, G., & Zhou, T. (2018). Semantic analysis of learners' emotional tendencies on online MOOC education. *Sustainability*, 10(6), 1921. <https://doi.org/10.3390/su10061921>
- *Wang, Z., Anderson, T., & Chen, L. (2018). How learners participate in connectivist learning: An analysis of the interaction traces from a cMOOC. *International Review of Research in Open and Distributed Learning*, 19(1). <https://doi.org/10.19173/irrodl.v19i1.3269>
- *Watson, S. L., Watson, W. R., Yu, J. H., Alamri, H., & Mueller, C. (2017). Learner profiles of attitudinal learning in a MOOC: An explanatory sequential mixed methods study. *Computers & Education*, 114, 274-285. <https://doi.org/10.1016/j.compedu.2017.07.005>
- *Williams, K. M., Stafford, R. E., Corliss, S. B., & Reilly, E. D. (2018). Examining student characteristics, goals, and engagement in massive open online courses. *Computers & Education*, 126, 433-442. <https://doi.org/10.1016/j.compedu.2018.08.014>

-
- *Wong, J., Khalil, M., Baars, M., de Koning, B. B., & Paas, F. (2019). Exploring sequences of learner activities in relation to self-regulated learning in a massive open online course. *Computers & Education*, 140, 103595. <https://doi.org/10.1016/j.compedu.2019.103595>
- *Wu, W. H., Kao, H. Y., Wu, S. H., & Wei, C. W. (2019). Development and evaluation of affective domain using student's feedback in entrepreneurial MOOC courses. *Frontiers in Psychology*, 10, 1109. <https://doi.org/10.3389/fpsyg.2019.01109>
- *Xing, W. (2019). Exploring the influences of MOOC design features on student performance and persistence. *Distance Education*, 40(1), 98-113. <https://doi.org/10.1080/01587919.2018.1553560>
- *Yang, H. H., & Su, C. H. (2017). Learner behavior in a MOOC practice-oriented course: In empirical study integrating TAM and TPB. *The International Review of Research in Open and Distributed Learning*, 18(5), 35-63. <https://doi.org/10.19173/irrodl.v18i5.2991>

Appendix B. Overview of measurement instruments adopted in the study presented in Chapter 3

Table B.1.
Overview of measurement instruments adopted in the study presented in Chapter 3.

Variable	Item
Perceived learning support	
Course design	Please indicate your perceptions toward the MOOC you attended in the following aspects (1 - <i>Strongly disagree</i> to 6 - <i>Strongly agree</i>): 1. The course and learning materials are coherently organized and well structured. 2. The platform is user friendly. 3. The required effort and learning outcomes were well-matched in this MOOC.
Interaction with instructors	Please indicate your perceptions toward the MOOC you attended in the following aspects (1 - <i>Strongly disagree</i> to 6 - <i>Strongly agree</i>): 1. The instructor gave me feedback in the course of learning. 2. The instructor counseled and supported me in the course of learning. 3. When I needed help in the course of learning, I could get in personal contact with the instructor. 4. The instructor interact with students in the discussion forums.
Interaction with peer students	Please indicate your perceptions toward the MOOC you attended in the following aspects (1 - <i>Strongly disagree</i> to 6 - <i>Strongly agree</i>): 1. I could exchange information and knowledge easily and quickly with peer students. 2. The communication in the discussion forums facilitated exchange of information with peer students. 3. Learning in groups and cooperation with other learners were supported in the courses (e.g., discussion forums and peer-review). 4. There were ample opportunities in the course to establish personal contact with peer students (e.g., discussion forums, peer-review, and group work).



Learner autonomy	Please indicate your perceptions toward the MOOC you attended in the following aspects (1 - <i>Strongly disagree</i> to 6 - <i>Strongly agree</i>): 1. I could individually decide what times and where I am learning this MOOC. 2. I could individually decide the use of learning strategies and the pace of learning. 3. This MOOC offers opportunities for self-paced chapter exercises and the application of one's knowledge. 4. This MOOC offers opportunities to control my learning outcomes (e.g. by self-tests).
Learning engagement	Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - <i>Never</i> to 5 - <i>Very often</i>): 1. I watched video lectures to master the subject matter in this MOOC. 2. I read course materials to enhance the understanding of the subject matter in this MOOC. 3. I completed the assignments before the deadline. 4. I submitted the assignments before the deadline. 5. I participated in the course assessments to exam what I learned in this MOOC (e.g., tests, quizzes, and exams). 6. I posted my views on the topics in discussion forums. 7. I replied to others' comments in discussion forums. 8. I commented on others' posts in discussion forums. 9. I provided feedback to other course participants in peer-review. 10. I reflected on the peer feedback to improve coursework in peer-review.
Self-regulated learning strategies	Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - <i>Very untrue of me</i> to 6 - <i>Very true of me</i>): 1. When I become confused about something, I return to the video lectures and course materials and try to figure it out. 2. I try to relate ideas in this subject to those in other courses whenever possible. 3. When watching video lectures and reading course materials for this MOOC, I try to relate the content to what I already know.

4. I try to understand the video lectures and course materials taught in this MOOC by making connections between the content and the concepts I can find in and outside this MOOC.
5. When studying video lectures and course materials for this MOOC I try to determine which concepts I don't understand well.
6. I try to apply ideas from video lectures and course materials in other course activities such as discussion forums.

Critical thinking

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 – *Very untrue of me* to 6 – *Very true of me*):

1. I often find myself questioning things I hear or read in this MOOC to decide if I find them convincing.
2. When a theory, interpretation, or conclusion is presented in the video lectures, course materials, or discussion forums, I try to decide if there is good supporting evidence.
3. I treat the video lecture and course materials as a starting point and try to develop my own ideas about it.
4. I try to play around with ideas of my own related to what I am learning in this MOOC.
5. Whenever I read an assertion or conclusion in this MOOC, I think about possible alternatives.

Metacognitive
self-regulation

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 – *Very untrue of me* to 6 – *Very true of me*):

1. When watching video lectures and reading course materials for this MOOC, I make up questions to help focus my watch and reading.
2. If video lectures and course materials are difficult to understand, I change the way I watch the lectures and read the material.
3. Before I study new video lectures and course materials thoroughly, I often skim it to see how they are organized.
4. I ask myself questions to make sure I understand the video lectures and course materials taught in this MOOC.
5. I try to change the way I study in order to fit the course requirements and the instructional methods used in this MOOC.
6. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this MOOC.
7. When I study for this MOOC, I write brief summaries of the main ideas from the video lectures, course materials.

8. When I study for this MOOC, I set goals for myself in order to direct my activities in each session.

Time and environment
management

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 – *Very untrue of me* to 6 – *Very true of me*):

1. I usually study in a place where I can concentrate on my course work.
2. I make good use of my study time for this MOOC.
3. I find it hard to stick to a study schedule in this MOOC.
4. I have a regular place set aside for studying this MOOC.
5. I make sure that I keep up with the weekly sessions and assignments for this MOOC.
6. I often find that I don't spend very much time on this MOOC because of other activities.
7. I rarely find time to review my notes, video lectures, or course materials.

Perceived learning
outcomes

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly disagree* to 6 - *Strongly agree*):

1. I have understood the video lectures and course materials taught in this MOOC.
2. I have learned the knowledge taught in the subject matter.
3. This MOOC expands my knowledge and skills of the subject.
4. I have developed skills on how to apply the knowledge in this MOOC.
5. I have developed the skills of communication and cooperation in this MOOC.
6. I have developed the skills of self-regulated learning in this MOOC.
7. I am pleased with what I learned in this MOOC.
8. I am appreciated the interaction with the instructor in this MOOC.
9. I am appreciated the interaction with peer students in this MOOC.

Appendix C. Overview of measurement instruments adopted in the study presented in Chapter 4

Table C.1.
Overview of measurement instruments adopted in the study presented in Chapter 4.

Variable	Item
Attitudes	Please indicate your perceptions toward learning in MOOCs in the following aspects (1 - <i>Completely inapplicable</i> to 5 - <i>Completely Applicable</i>): 1. Learning in MOOCs makes my study more satisfying. 2. I like learning in MOOCs. 3. I feel more motivated when I am learning in MOOCs. 4. Because of learning in MOOCs, my study becomes more efficient. 5. Learning in MOOCs in an effective way enhances my learning productivity. 6. Learning in MOOCs improves my academic performance.
Self-efficacy	Please indicate your perceptions toward learning in MOOCs in the following aspects (1 - <i>Very untrue of me</i> to 5 - <i>Very true of me</i>): 1. I believe I can learn a lot in MOOCs. 2. I am certain I can understand the most difficult material presented in MOOCs. 3. I am confident I can learn the basic concepts taught in MOOCs. 4. I am confident I can understand the most complex material presented in MOOCs. 5. I am confident I can do an excellent job in MOOCs. 6. I expect to do well in MOOCs. 7. I am certain I can master the skills being taught in MOOCs. 8. Concerning the difficulty of MOOCs and my skills, I think I can do well in MOOCs.
Task value	
Intrinsic value	Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - <i>Strongly Disagree</i> to 5 - <i>Strongly Agree</i>): 1. This MOOC is interesting to me. 2. I find studying for this MOOC is interesting.



3. Compared to other courses, I like this MOOC very much.
4. I am fascinated by this MOOC.
5. I enjoy this MOOC.
6. This MOOC is exciting to me.
7. I like this MOOC.

Attainment value

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. Being good at solving problems in this MOOC is important to me.
2. Compared to other courses, doing well in this MOOC is important to me.
3. Being someone who does well at this MOOC is important to me.
4. Doing well at this MOOC is an important part of who I am.

Utility value

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. This MOOC is useful for what I want to do after I graduate.
2. This MOOC will be important when I get a job or go to graduate school.
3. This MOOC will be useful for me later in life.
4. What I am learning in this MOOC is useful because they will help me in the future.

Perceived cost

Task effort cost

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. This MOOC demands too much of my time.
2. I have to put too much energy into this MOOC.
3. This MOOC takes up too much time.
4. This MOOC is too much work.
5. This MOOC requires too much effort.

Loss of valued alternatives

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. I have to sacrifice too much to be in this MOOC.

2. This MOOC requires me to give up too many other activities I value.
3. Taking this MOOC causes me to miss out on too many other things I care about.
4. I can't spend as much time doing the other things that I would like because I am taking this MOOC.
5. I pay attention to this MOOC.

Emotional cost

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. I worry too much about this MOOC.
2. This MOOC is too exhausting.
3. MOOC is emotionally draining.
4. This MOOC is too frustrating.
5. This MOOC is too stressful.
6. This MOOC makes me feel too anxious.

Learning engagement

Cognitive Engagement

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. When doing coursework in this MOOC, I try to relate what I'm learning to what I already know.
2. I study this MOOC, I try to connect what I am learning with my own experiences.
3. I try to make all the different ideas fit together and make sense when I study this MOOC.
4. I make up my own examples to help me understand the important concepts I study in this MOOC.
5. Before I begin to study this MOOC, I think about what I want to get done.
6. When I'm working on my coursework in this MOOC, I stop once in a while and go over what I have been doing.
7. As I study this MOOC, I keep track of how much I understand, not just if I am getting the right answers.
8. If what I am learning in this MOOC is difficult to understand, I change the way I learn the material.

Behavioral
Engagement

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. I study this MOOC carefully.
2. I try hard to do well in this MOOC.
3. When I start a new topic in this MOOC, I learn it very carefully.
4. I work hard when I start something new in this MOOC.
5. I pay attention to this MOOC.

Emotional
Engagement

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. I enjoy learning new things in this MOOC.
2. When I work on something in this MOOC, I feel interested.
3. When I study this MOOC, I feel curious about what I am learning.
4. This MOOC is fun.
5. When I work on something in this MOOC, I get involved.

Perceived learning
outcomes

Please indicate how you feel about learning in the MOOC you attended in the following aspects (1 - *Strongly Disagree* to 5 - *Strongly Agree*):

1. I have understood the content and concepts in the subject matter of this MOOC.
2. I have learned the knowledge taught in the subject matter of this MOOC.
3. This MOOC expands my knowledge of the subject.
4. I have developed skills on how to apply the knowledge in this MOOC.
5. I have developed the skills of communication and cooperation in this MOOC.
6. I have developed the skills of self-regulated learning in this MOOC.
7. I am pleased with what I learned in this MOOC.
8. I am appreciated the interaction with the instructor in this MOOC.
9. I am appreciated the interaction with peer students in this MOOC.

