

Examining e-mentoring: Factors That Influence Online Undergraduate Students' Perceptions of E-Mentoring

Baciu, C. & Brazelton, B.
Northern Arizona University

Abstract

As online education evolved over the recent decades, so did the practice of e-mentoring. Research suggests that the benefits of mentoring (in-person relationships) often apply to e-mentoring (online relationships), with e-mentoring having the potential to reach individuals from all around the world and provide increased access to mentoring opportunities for students from all backgrounds.

This study examines individual characteristics that influence online undergraduate students' perceptions of e-mentoring, specifically the impact of gender, age, digital competence, social self-efficacy, and goal orientation on the four domains of mentoring (psychological support, degree and career support, academic subject knowledge support, and role modeling). Data were collected from a nationally representative sample of 414 online undergraduate students. We found that digital competence and goal orientation significantly influence students' perceptions of the four domains of mentoring. Social self-efficacy influenced students' perceived experiences of role modeling, and gender influenced students' perceptions of psychological support, with men reporting less psychological support from their mentors. Despite significant research on mentoring in general, with the dearth of scholarship on e-mentoring, mentors and administrators of e-mentoring programs (or mentoring programs still operating at least partially online due to the pandemic) need a better understanding and more practical application recommendations for supporting students across the transactional distance of remote engagement.

Understanding E-mentoring: A Quantitative Study of Online Undergraduate Students

As of Fall 2019, over 6 million undergraduate college students were enrolled in online courses in the United States, making up for almost 37% of the entire undergraduate student body nationwide (National Center for Education Statistics, 2020). Not surprisingly, as of Fall 2021, these numbers have significantly increased, with almost 52% of the entire U.S. college population being enrolled in some form of online and distance education, likely due to the COVID-19 pandemic (Smalley, 2021). While online education offers various advantages to students, such as increased access to opportunities, reduced physical barriers, increased flexibility and self-paced learning, a more optimal school-life balance, and reduced stress, it is unclear to what extent online students have access to and engage in e-mentoring, and how that helps shape their college experiences (Tinoco-Giraldo et al., 2020).

E-mentoring, including online mentoring, virtual mentoring, telementoring, cyber mentoring, Internet mentoring, or computer-based mentoring, is defined as "a computer-mediated, mutually beneficial relationship between a mentor and a protege which provides learning, advising, encouraging, promoting, and modeling that is often boundaryless, egalitarian, and qualitatively different than traditional face-to-face mentoring" (Bierema & Merriam, 2002, p. 219). In other words, e-mentoring consists of a relationship and a process in which the mentor and the mentee engage and communicate with one another online, with the purpose of supporting the mentee and helping them achieve their goals (Neely et al., 2017).

How Do Online Undergraduate Students Benefit From E-mentoring?

Contemporary online undergraduate students are highly busy individuals who often have well-established careers and who are seeking to reskill or upskill to advance their personal and professional lives (Magda et al., 2020). Students who have access to mentoring opportunities do better academically, are more engaged on campus, show increased rates of persistence and graduation, are able to grow their social capital networks, and have significantly more professional prospects post-graduation (Crisp et al., 2017). The same benefits extend to e-mentoring relationships, which can be just as effective as the in-person mentoring, and, in some cases, even stronger considering that e-mentoring offers the incredible advantage of breaking down physical and geographical barriers and bringing people together regardless of their location in the world (Rowland, 2012).

E-mentoring is critical in helping online students make significantly greater academic progress, earn higher grades and GPAs, contributing to increased academic retention and graduation rates, and keeping students on track to graduate within a

reasonable timeframe (Tinoco-Giraldo et al., 2020). For online students particularly, e-mentoring proves to be highly beneficial as it helps them achieve greater feelings of belonging and relatedness, less stress and anxiety, extended social networks, and better professional connections that stem from their enhanced social capital (Guse et al., 2020). Students who are engaged in e-mentoring are able to develop better interpersonal, communication, and teamwork skills, reporting richer career and professional development, clearer goals, and higher self-confidence, self-esteem, and self-efficacy (Adams & Crews, 2004). Furthermore, students engaged in e-mentoring relationships tend to experience increased self-awareness and reflective skills and report being more aware of their strengths and weaknesses (Headlam-Wells et al., 2006).

Research Question

Despite these many benefits of mentoring, only 22% of undergraduate students indicate that they have had access to mentoring while in college (National Academies of Sciences, Engineering, and Medicine, 2020). Reported low access to mentoring is probably not due to a lack of interest, as 66% of students indicate that they are interested in having a mentor but are not sure how to find a mentor (53%) and do not know what to ask of a mentor (25%) (Ezarik, 2021). Even when e-mentoring opportunities are available to online undergraduate students, engagement is varied, possibly due to a lack of awareness, not being sure what to expect from an e-mentoring program, or other commitments and responsibilities (Tinoco-Giraldo et al., 2020). Previous research also suggests that various individual characteristics, such as gender, age, or social self-efficacy, might influence people's interest in and involvement with e-mentoring (Neely et al., 2017). Therefore, this study sought to answer the following main research question: What individual characteristics influence online undergraduate students' perceptions of e-mentoring?

Theoretical Foundations of E-mentoring

The e-mentoring model. Addressing the lack of e-mentoring theoretical foundations, Neely et al. (2017) have introduced the e-mentoring model, a framework composed of four interacting dimensions: 1) the context of mentoring, 2) mentors and their characteristics, 3) mentees and their characteristics, and 4) e-mentoring process. The context of mentoring comprises three distinct areas: virtual mentoring vs. hybrid mentoring, the e-mentoring matching process, and formal e-mentoring vs. informal e-mentoring opportunities (Neely et al., 2017). There are certain individual characteristics that affect the e-mentoring relationship, such as gender, age, computer literacy, perceived similarity, extraversion, and proactive personality, all of which likely influence how e-mentoring relationships get established and evolve (Neely et al., 2017). This study focused on the mentees' characteristics and assessed them in relation to the domains of mentoring.

The domains of mentoring. Previous research has identified four domains of mentoring (1) psychological and emotional support, (2) goal setting and career paths, (3) academic subject knowledge support, and (4) role modeling (Nora and Crisp, 2007). According to the psychological and emotional support domain, the mentoring relationship is based on active listening, support and understanding, helping the mentee identify problems and come up with potential solutions, and continuously developing the mentoring relationship. The goal-setting and career paths domain refers to the fact that the mentor aims to help the mentee identify their strengths, abilities, and weaknesses, and provide the mentee with advice on strengthening their academic and career goals. The academic subject knowledge support domain poses that the mentor helps the mentee identify and achieve various needed skills and knowledge targeting subject learning and academic development. Finally, the role modeling domain suggests that the mentee should be able to learn from their mentor's past experiences, achievements, and failures (Nora & Crisp, 2007).

The domains of mentoring are based on the underlying assumption that the mentoring relationship exists in a safe environment in which both the mentor and the mentee are comfortable having open in-depth conversations, with the purpose of fostering a detailed exploration of interests, through critical thinking and reflective processes so that the mentee is supported in discovering and pursuing various personal and professional interests. In an effective mentoring relationship, mentees who score higher on the domains of mentoring are able to address fears and uncertainties with their mentors and benefit from their mentor's shared knowledge, building self-confidence and a clear path towards accomplishing their goals.

Individual Characteristics and the Domains of E-mentoring

This study drew on Neely et al.'s (2017) e-mentoring model, focusing on mentees' individual characteristics and how they might interact with the domains of mentoring. Neely et al. (2017) have identified gender, age, computer literacy, perceived similarity, extraversion, and proactive personality as individual characteristics that might influence e-mentoring relationships

and their effectiveness. This study focused on gender and age, and adapted the remaining variables as follows: 1) computer literacy into digital competence, 2) extraversion into social self-efficacy, and 3) proactive personality into goal orientation. Computer literacy, extraversion, and proactive personality are broad terms that have been extensively studied; these terms carry complex meanings and can be difficult to accurately assess, which is why we chose to focus on terms that can be more accurately measured in the context of an online undergraduate student population by using validated scales as applicable to the concepts themselves and/or to mentoring research (Pettersson, 2017). For example, computer literacy refers to one's ability and knowledge to use technology efficiently, whereas digital competence is a contemporary term used to capture a broader range of skills and abilities that relate to the gathering, processing, and managing information and communication technologies while accounting for ethical decision making (Pettersson, 2017).

Gender. There are often differences between how men and women engage in mentoring relationships (Crisp et al., 2017). Some researchers argue that women are less likely to seek out mentoring opportunities as mentees (Ragins, 2007), while others suggest that men are actually the ones who are less likely to pursue a mentoring relationship due to the fact that they might perceive getting help as a form of weakness (Darling et al., 2006). Recent studies have shown that e-mentoring provides a safer environment for women because the virtual medium helps to conceal various individual characteristics and makes it easier to navigate potential stereotypes (Bierema & Merriam, 2002). For example, women engaged in e-mentoring relationships might benefit from having access to a larger variety of potential mentors and mentoring opportunities without having to navigate misconceptions about their professional relationships (Bierema & Merriam, 2002).

Age. By definition, mentoring is a relationship between an experienced, usually older, and a less experienced, usually younger individual (Crisp et al., 2017; Neely et al., 2017). Previous studies have focused on studying the dyads resulting from pairing older mentors with younger mentees but not that much on trying to understand how mentees' age impacts their perceptions of e-mentoring (Doerwald et al., 2015). For example, it can be argued that the mentoring needs and wants of traditional and adult undergraduates can be quite different and will impact how they engage in mentoring opportunities while in college (Neely et al., 2017). Furthermore, as individuals age, their emotional abilities (i.e., emotion perception, emotion regulation) are likely to increase, meaning that the individual will be able to invest more in a mentoring relationship, leading to increased trust and higher support provided to the mentee in various domains (Doerwald et al., 2015).

Digital competence is defined as

the set of knowledge, skills, attitudes, abilities, strategies, and awareness that are required when using ICT [information and communication technologies] and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning and socializing. (Ferrari, 2012, p. 30).

Digital competence is a critical skill in today's highly interconnected and competitive world, and higher education is no exception, as students must be able to navigate various digitalized environments in order to achieve their educational goals (Pettersson, 2017). However, many undergraduate students, even those enrolled in online degrees, might lack digital competence skills (Losh, 2021). While digital competence in relation to e-mentoring remains understudied, some research indicates that digital competence is key to e-mentoring relationships since most, if not all, of the interactions take place online and use various tools and methods of communication (Losh, 2021).

Social self-efficacy refers to one's perceptions of their ability to make friends and acquaintances easily, in other words, it refers to one's perception of their interpersonal skills (Li et al., 2018). Social self-efficacy is a predictor of various outcomes for undergraduate students, such as their adjustment to college and their involvement in student life activities (Li et al., 2018). Perceived social self-efficacy impacts individuals' inclination to reach out to people and their predisposition to engage in mentoring relationships (Li et al., 2018). Though not much research is available on social self-efficacy and e-mentoring, it can be argued that social self-efficacy will significantly impact students' perceptions of the domains of e-mentoring.

Goal orientation is a term used to describe an individual's motivation to achieve certain tasks, objectives, and goals (Kaplan & Maehr, 2007). Goal orientation is a significant predictor of students' ability to regulate their behavior and academic performance, and of their overall success in college (Egan, 2005). Students who score higher on goal orientation measures are more likely to seek out mentoring opportunities and engage in mentoring relationships (Egan, 2005). Not much is known about goal orientation and its relationship with e-mentoring, however, one would expect that individuals who score high on

goal orientation measures are most likely to engage in e-mentoring relationships and perceive more favorably the domains of e-mentoring.

Methods

The study collected data from 414 online undergraduate students. Participants took a 10-minute survey consisting of the following scales: 1) the college student mentoring scale, which has four components: psychological and emotional support, degree and career support, academic knowledge support, and the existence of a role model (Crisp, 2009), 2) the digital competence scale, which is composed of two sub-scales: technical literacy and digital skills (Wang et al., 2021), 3) the social self-efficacy scale (Sherer et al., 1982), and 4) the goal orientation scale (Midgley et al., 2000). These items were assessed on 5-point Likert scales, ranging from strongly disagree to strongly agree. Additionally, questions about participants' age and gender were asked. Participants were compensated for their time with the equivalent of \$20/hour through Prolific.

Findings

The average age of the participants in this study was 23.55 years old ($M = 23.55$, $SD = 6.00$). While coding the data, we created age categories which resulted in 79.5% of participants being between 18-25 years old, 15% of participants being between 26-35 years old, 3.4% being 36-45 years old, and 2.2% were 46-55 years old. Most participants (65.5%) identified as female. Participants self-identified as white 53.4%, Asian 14.5%, two or more races 12.5%, Hispanic or Latino 12.1%, and Black or African American 7.5%. We conducted a series of MANOVA analyses to analyze the impact of individuals' characteristics on the domains of e-mentoring. We present our findings below.

Age. We did not find a significant effect of age on online undergraduates' perceptions of e-mentoring domains, $F(12, 1074) = .89$, $p = .554$; Wilk's $\Lambda = .97$, partial $\eta^2 = .009$.

Gender. We found that gender significantly impacts online students' perceptions of e-mentoring, $F(8, 810) = 2.6$, $p = .009$; Wilk's $\Lambda = .95$, partial $\eta^2 = .025$. Specifically, in our sample, males reported lower levels of perceived psychological and emotional support in their e-mentoring relationships than women did ($p < .05$).

Digital competence. Digital competence significantly influenced online undergraduate students' perceptions of e-mentoring, $F(8, 814) = 6.67$, $p = .000$; Wilk's $\Lambda = .88$, partial $\eta^2 = .061$. Specifically, digital competence impacts students' perceptions of psychological and emotional support ($F(2, 410) = 10.32$; $p = .000$; partial $\eta^2 = .048$), degree and career support ($F(2, 410) = 13.62$; $p = .000$; partial $\eta^2 = .062$), academic subject knowledge support ($F(2, 410) = 15.22$; $p = .000$; partial $\eta^2 = .069$), and role modeling ($F(2, 410) = 20.71$; $p = .000$; partial $\eta^2 = .092$). Furthermore, a Tukey's HSD post-hoc test revealed that students who are highly skilled in digital competence are more likely to report higher degrees of received psychological and emotional support ($p < .05$), degree and career support ($p < .05$), academic subject knowledge support ($p < .05$), and role modeling ($p < .05$) within their e-mentoring relationships.

Social self-efficacy. Social self-efficacy was found to significantly influence online undergraduate students' perceptions of e-mentoring, $F(8, 808) = 4.64$, $p = .000$; Wilk's $\Lambda = .91$, partial $\eta^2 = .044$, particularly for the role modeling domain of e-mentoring ($F(2, 407) = 10.31$; $p = .000$; partial $\eta^2 = .048$). Surprisingly, social self-efficacy was not found to influence students' perceptions of the other three domains of e-mentoring.

Goal orientation. Goal orientation significantly impacted students' perceptions of e-mentoring, $F(8, 814) = 11.29$, $p = .000$; Wilk's $\Lambda = .81$, partial $\eta^2 = .010$, yielding significant results for all the four domains of e-mentoring: psychological and emotional support ($F(2, 410) = 10.59$; $p = .049$; partial $\eta^2 = .048$), degree and career support ($F(2, 410) = 25.56$; $p = .000$; partial $\eta^2 = .111$), academic subject knowledge support ($F(2, 410) = 35.23$; $p = .000$; partial $\eta^2 = .147$), and role modeling ($F(2, 410) = 17.30$; $p = .000$; partial $\eta^2 = .078$). A Tukey's HSD post-hoc test showed that the higher students score on goal orientation skills, the more likely they are to report increased perceptions of psychological and emotional support ($p < .05$), degree and career support ($p < .05$), academic subject knowledge support ($p < .05$), and role modeling ($p < .05$) within their e-mentoring relationships.

Discussion

As the study centered on the student perceptions of e-mentoring, the findings help to explain why students may or may not choose to participate in an e-mentoring opportunity. Findings are briefly discussed in this section. While there was no

statistically significant relationship between age and mentoring domains, this may be due to the overrepresentation of 18-25 year old participants in the sample. Even still, the data shows some differentiation by age in that younger participants may be experiencing the mentoring domains of digital competence, social self-efficacy, and goal orientation differently than older participants, but further study is needed.

When examining the differences between genders in perceptions of support, male students may be receiving less support for their psychological and emotional needs from mentors, have difficulty understanding when mentors are offering psychological and emotional support, or are not asking for support for these needs from their mentors. This finding echoes much of the literature regarding male students' lack of or difficulty with engagement in higher education, and the varied possible explanations (Fiorello & Lester, 2019).

Beyond age and gender, the domains of mentoring findings show that the higher a participant reports levels of digital competence, social self-efficacy, and goal orientation (individually), then the higher their perceptions of e-mentoring. The positive relationship between these domains and perceptions of e-mentoring implies that the domains should be taken into consideration when designing and executing an e-mentoring program, potentially as part of the e-mentoring program events, outcomes, and responsibilities of the mentors. Being adept in digital competence, social self-efficacy, and goal orientation are likely positive traits for college students in environments beyond mentoring, yet mentoring remains a way to support the development of these skills as they are not necessarily explicit components of academic curriculums.

Recommendations and Conclusion

There is limited research available on e-mentoring and even more so on e-mentoring as it relates to online undergraduate students and their perceptions of it. This study contributes to filling gaps in the e-mentoring literature by seeking to understand what individual characteristics might influence online students' perceptions of e-mentoring. Given the relationship between digital competence and perceptions of e-mentoring, institutions or particular units should assess the digital competency and literacy of their students to best understand how to maximize the potential of selected technology used in an e-mentoring program. An e-mentoring program may not need much technology beyond video call software, email, and phones, but if an e-mentoring program wanted to leverage the institutional learning management system or other engagement platform, then it is important to understand how the medium (technology) provides access to the message (mentoring). Additionally, with scholarship on goal orientation showing the importance of guiding students through goal setting so as to encourage intrinsic motivation, formal goal setting can be an important part of the mentoring program that both improves the perception of e-mentoring and for more general academic success.

This study will also help advance the e-mentoring practice by seeking to understand how online undergraduate students view e-mentoring. The resulting information can be used in the decision-making processes of designing and deploying responsive e-mentoring opportunities for online students. For example, with findings suggesting that perceived digital competence prevents individuals from engaging in e-mentoring relationships, practitioners can use that information to provide guidance and training to students before encouraging them to seek out mentoring opportunities. Functionally, mentoring does not have to operate any differently across different modalities, however different modalities bring unique challenges to those offering such service. For mentoring relationships fully or primarily online, perception matters. One model to address the perception of e-mentoring could be to begin with a pilot model of a smaller number of mentees paired with mentors adept and comfortable with technology, then assess and respond. If the program is successful, sharing these successes may encourage more students to consider a virtual relationship with their mentor via an e-mentoring program.

References

- Adams, G., & Crews, T. B. (2004). Telementoring: A viable tool. *Journal of Applied Research for Business Instruction*, 2(3), 1-4.
- Bierema, L. L., & Merriam, S. B. (2002). E-mentoring: Using computer mediated communication to enhance the mentoring process. *Innovative Higher Education*, 26(3), 211-227. <https://doi.org/10.1023/A:1017921023103>
- Crisp, G. (2009). Conceptualization and initial validation of the College Student Mentoring Scale (CSMS). *Journal of College Student Development*, 50(2), 177- 194. <https://doi.org/10.1353/csd.0.0061>
- Crisp, G., Baker, V. L., Griffin, K. A., Lunsford, L. G., & Pifer, M. J. (2017). Mentoring undergraduate students. *ASHE Higher Education Report*, 43(1). John Wiley & Sons.
- Darling, N., Bogat, G. A., Cavell, T. A., Murphy, S. E., & Sánchez, B. (2006). Gender, ethnicity, development, and risk: Mentoring and the consideration of individual differences. *Journal of Community Psychology*, 34(6), 765-780. <https://doi.org/10.1002/>

[jcop.20128](#)

- Doerwald, F., Scheibe, S., & Van Yperen, N. W. (2015). Role of age in workplace mentoring. *Encyclopedia of Geropsychology*. New York: Springer. https://doi.org/10.1007/978-981-287-080-3_34-1
- Egan, T. M. (2005). The impact of learning goal orientation similarity on formal mentoring relationship outcomes. *Advances in Developing Human Resources*, 7(4), 489- 504. <https://doi.org/10.1177%2F152342230527967>
- Ezarik., M. (2021, October 22). Savvy students get the guidance. *Inside Higher Ed*. <https://www.insidehighered.com/news/2021/10/22/college-mentor-relationships-reachsavvy-students-most>
- Ferrari, A. (2012). *Digital competence in practice: An analysis of frameworks*. Sevilla: Joint Research Centre (JRC), European Commission. <http://www.ifap.ru/library/book522.pdf>
- Fiorello, C. M., & Lester, J. (2019). Engaging cisgender women and men students. In S. J. Quaye, S. R. Harper, & S. L. Pendakur (Eds.), *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations* (3rd ed., pp. 197-220). Routledge.
- Guse, J., Heinen, I., Kurre, J., Mohr, S., & Bergelt, C. (2020). Perception of the study situation and mental burden during the COVID-19 pandemic among undergraduate medical students with and without mentoring. *GMS Journal for Medical Education*, 37(7). <https://dx.doi.org/10.3205%2Fzma001365>
- Kaplan, A., & Maehr, M. L. (2007). The contributions and prospects of goal orientation theory. *Educational Psychology Review*, 19(2), 141-184. <https://doi.org/10.1007/s10648-006-9012-5>
- Li, M. H., Eschenauer, R., & Persaud, V. (2018). Between avoidance and problem solving: Resilience, self efficacy, and social support seeking. *Journal of Counseling & Development*, 96(2), 132-143. <https://doi.org/10.1002/jcad.12187>
- Losh, E. (2021). Universities must stop presuming that all students are tech-savvy. *Times Higher Education*. <https://www.timeshighereducation.com/opinion/universities-must-stoppresuming-all-students-are-tech-savvy>
- Magda, A. J., Capranos, D., & Aslanian, C. B., (2020). *Online college students 2020: Comprehensive data on demands and preferences*. Louisville, KY: Wiley Education Services.
- Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., & Urdan, T. (2000). *Manual for the patterns of adaptive learning scales*. Ann Arbor: University of Michigan.
- National Center for Education Statistics. (2020). *Distance learning*. <https://nces.ed.gov/fastfacts/display.asp?id=80>
- National Academies of Sciences, Engineering, and Medicine (NAP) (2020). *The Science of Effective Mentorship in STEM*. <https://www.nap.edu/resource/25568/interactive>
- Neely, A. R., Cotton, J., & Neely, A. D. (2017). E-mentoring: A model and review of the literature. *AIS Transactions on Human-Computer Interaction*, 9(3), 220- 242. <https://aisel.aisnet.org/thci/vol9/iss3/3>
- Nora, A., & Crisp, G. (2007). Mentoring students: Conceptualizing and validating the multidimensions of a support system. *Journal of College Student Retention*, 9(3), 337-356. <https://doi.org/10.2190%2FCS.9.3.e>
- Pettersson, F. (2017). On the issues of digital competence in educational contexts – a review of literature. *Education and Information Technologies*, 23(3), 1005-1021. <https://doi.org/10.1007/s10639-017-9649-3>
- Ragins, B. R. (2007). Diversity and workplace mentoring: A review and positive social capital approach. In T.D. Allen & L.T. Eby (Eds.), *Blackwell handbook of mentoring: A multiple perspectives approach* (pp. 281-300). Oxford, UK: Blackwell.
- Rowland, K. N. (2012). E-mentoring: An innovative twist to traditional mentoring. *Journal of Technology Management & Innovation*, 7(1), 228-237. <http://dx.doi.org/10.4067/S0718-27242012000100015>
- Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The self-efficacy scale: Construction and validation. *Psychological Reports*, 51(2), 663-671. <https://doi.org/10.2466%2Fpr0.1982.51.2.663>
- Smalley, S. (2021). Half of all college students take online courses. *Inside Higher Ed*. <https://www.insidehighered.com/news/2021/10/13/new-us-data-show-jumpcollege-students-learning-online>
- Tinoco-Giraldo, H., Torrecilla Sanchez, E. M., & Garcia-Peñalvo, F. J. (2020). E-mentoring in higher education: a structured literature review and implications for future research. *Sustainability*, 12(11), 4344. <https://doi.org/10.3390/su12114344>
- Wang, X., Wang, Z., Wang, Q., Chen, W., & Pi, Z. (2021). Supporting digitally enhanced learning through measurement in higher education: Development and validation of a university students' digital competence scale. *Journal of Computer Assisted Learning*, 37(4), 1063-1076. <https://doi.org/10.1111/jcal.12546>