Connected Classroom Climate in Higher Education: A Scoping Review

Jason MacLeod
School of Educational Information Technology
Central China Normal University
Wuhan, China
jason.w.macleod@gmail.com

Harrison Hao Yang
School of Education
State University of New York at Oswego
New York, United States
School of Educational Information Technology
Central China Normal University
Wuhan, China
harrison.yang@oswego.edu

***Abstract*—The introduction of Dwyer et al.'s [1] Connected Classroom Climate Inventory (CCCI) began a seminal divergence of research focusing toward student-to-student socialization and behavior in educational environments. Connected classroom climate research has provided meaningful direction for improving instructional processes in face-to-face environments for nearly fifteen years. However, understanding of student-to-student connectedness is lacking in modern technology-mediated environments—arguably where student-to-student connectedness is most needed. This study presents a synthesis of peer-reviewed journal articles [2-17] that empirically utilized the CCCI within face-to-face, hybrid, and online environments to support future research on this important topic.**

Keywords—*Connected Classroom Climate, connectedness, student-to-student, CCCI, self-report instrumentation, scoping review*

I. INTRODUCTION

Communication and human interaction can either positively or negatively influence the atmosphere and learning experience of both face-to-face (F2F) and technology-mediated learning environments. Early research on this topic focused toward supportive and defensive communication behaviors [18] and typically emphasized only instructor-to-student interactions [1]. This trend may have occurred in response to the traditions of instructor-centered pedagogy providing contexts where instructors disseminate knowledge. That is to say, instructors were the primary research focus because instructors' responsibility was to lead all classroom activities. Control was authoritative [19] and learning activities and spaces were designed to minimize any other potentially disturbing student-to-student interactions [20]. However, in recent decades, the widespread adoption of student-centered pedagogies [21] and emphasis toward 21st century skills, such as critical thinking, communication, collaboration, and creativity [22], has expanded the lens of communication research. Such educational modernizations have stimulated student-to-student research focuses, of which, connectedness has emerged as a critical variable for examining the depth of peer relationships, as well as peers' influence toward individuals' learning.

'Connectedness' is a term that has been defined in various ways among research and literature. One broad and prominent definition describes "when a person is actively involved with another person, object, group, or environment, and that involvement promotes a sense of comfort, well-being, and anxiety-reduction" [23]. Connected classroom climate (CCC) hones this conceptualization of connectedness to a student-focused academic perspective of the topic and is defined as "student-to-student perceptions of a supportive and cooperative communication environment in the classroom" [1]. CCC is important because it has been shown to increase classroom participation [5, 7], and shown positive associations with students learning [3, 5-7, 24-25]. In contrast, lower levels of connectedness have been suggested to contribute to low self-esteem, loneliness, and depression [26]. When further considering the fact that technology-mediated learning environments often isolate individuals away from traditional forms of F2F classroom interaction, the issue of increasing CCC among students in technology-mediated learning environments becomes an issue of critical importance.

Technology-mediated learning environments have also changed educational contexts by redistributing the time, place, path, and/or pace that students operate [27]. This procedural shift provides new opportunities for students' learning. However, the fundamental concept of a hybrid or online instructional approach requires at least a partial removal of the instructors' F2F contact time with students, which further elevates the importance of student-to-student communication and relationships [14].

Nearly fifteen years has past since the introduction of CCC and much research has been published across the domains of communication, education, and computer science. To the best of our knowledge, no reviews of the literature have been conducted on CCC. Thorough reviews of previous literature provide an effective means for establishing the foundations of knowledge, identifying needs, and strengthening research fields [28]. Therefore, this scoping review presents a synthesis of research to expedite future exploration of this important issue in higher education.

II. METHODOLOGY

This scoping review was based on Arksey and O'Malley's [29] five-stage framework. This framework provided a rigorous and transparent methodological guide which has recently been utilized within similar fields of

978-1-5386-7209-9/18/$31.00 ©2018 IEEE
DOI 10.1109/ISET.2018.00033

educational research, such as for a scoping review on flipped classroom instruction [30]. The five-stage framework suggests to: (1) identify research questions, (2) identify the body of research, (3) refine a selection of research, (4) describe the documentation of data, and (5) synthesize and report the results.

A. Research Questions

The following research questions were proposed:

1. What descriptive data has been reported for CCC in various F2F, hybrid, and online environments?
2. What socio-cultural contexts have been explored?
3. How does CCC influence students' learning?
4. How does CCC influence student' communication and behavior?
5. How does CCC influence instructors' communication and behavior?

B. Identifying Research

Since this scoping review was based upon a specific research instrument, the Connected Classroom Climate Inventory (CCCI) [1], *GoogleScholar* was used to export the 'cited by' list of references. At the time this research was conducted, 46 studies were identified.

C. Refining a Selection of Research

The initial list of 46 studies were refined to 17 studies based upon the follow criteria:

1. Research must be published in English.
2. Research must be peer-reviewed journal articles.
3. Research must use the CCCI for empirical research.
4. Research must use the complete 18 items of the CCCI.
5. Participants must be enrolled in higher education.

D. Describing the Documention of Data

When reading through the selected research, brief summaries were developed for each journal article, including the authors' information, year of publication, type of learning environment, socio-cultural context of the study (e.g., course subject, national and linguistic context, type of participants), sample size, and some brief comments relating to the findings of the study. Details of the 17 selected journal articles are summarized in Table 1 and Table 2.

E. Synthesizing and Reporting the Results

In accordance with the five-stage framework [29], the results are synthesized and reported in the following sub-sections, which are organized in alignment with the research questions guiding this scoping review.

III. Results & Discussion

A. Descriptive Data

Research question one queried the descriptive data reported for CCC. Among the 17 peer-reviewed journal articles that have reported data on the full 18-item CCCI construct [1], most research has been within F2F learning environments [1-13]. As shown in Table 1, CCC has also been examined in cloud classrooms [14, 16], compared between F2F and hybrid instructional delivery approaches [15], and examined in synchronous smart classrooms [17]. At this point, additional research is needed to clarify CCC in technology-mediated environments.

TABLE I. Overview of Reported CCC Findings

ID	Year of Publication	Item-mean reporting [a]		Scale-mean reporting [b]		Learning environment
		M	*SD*	*M*	*SD*	
[1]	2004	----	----	70.97	9.91	F2F
[2]	2006	----	----	70.92	9.92	F2F
[3]	2009	----	----	72.22	10.12	F2F
[4]	2009	----	----	70.95	9.96	F2F
[5]	2010	----	----	59.27	11.82	F2F
[6]	2010	----	----	61.94	13.02	F2F
[7]	2011	----	----	67.37	14.39	F2F
[8]	2012	----	----	69.12	14.12	F2F
[9]	2013	----	----	66.95	10.58	F2F
[10]	2013	3.53	0.67	----	----	F2F
[11]	2015	----	----	62.38	12.10	F2F
[12]	2016	----	----	58.33	13.26	F2F
[13]	2017	----	----	66.20	14.72	F2F
[14]	2017	3.63	0.55	65.34	9.89	Cloud Classroom
[15]	2018	4.08 4.23	0.80 0.74	73.35 75.86	9.01 8.55	F2F Hybrid
[16]	2018	2.91	0.91	----	----	Cloud Classroom
[17]	In press	3.79	0.41	68.27	7.34	Synchronous Smart Classrooms

[a] Reported average of the 18 items instrument.
[b] Reported sum of the 18 item instrument.

Research has reported the findings of CCC in two different ways. The most common method is by scale-mean scores, which is equal to the sum of the 18 item scores for the construct. A secondary way is to report item-mean scores, which is equal to the average of the 18 item score for the construct. Research has reported a scale-mean score range of roughly 58 to 76. The item-mean score range was 2.91 to 4.23. As may be expected, the results were generally observed higher in F2F environments in comparison to online environments, although there were some exceptions [5-6, 11-12]. One comparative study showed slightly higher CCC scores in a hybrid course when compared to F2F [15, 31]; however, in general both scores were higher than average, and it was likely due to the relatively small research sample size.

B. Socio-cultural Context of Participants

Research question two inquired the socio-cultural contexts to which CCC has been explored. Most research has been situated within the USA at the undergraduate level of higher education. Communication-related subject matters are most explored, with only some multidisciplinary [8-9, 13-14] and non-communication related subject examinations [15-17]. Research has primarily been conducted in English speaking contexts, although three selected articles utilized a Mandarin translation of the instruments [14, 16-17]. One

study was identified that translated the instrument into Turkish [32]; however, the study was also published in Turkish so it did not meet the research criteria for this scoping review.

TABLE II. OVERVIEW OF SOCIO-CULTURAL CONTEXTS

ID	Study Subject	National Context	Linguistic Context	College-level	Sample Size
[1]	Communicat. Studies	USA	English	Undergrad	564
[2]	Communicat. Studies	USA	English	Undergrad	523
[3]	Public Speaking	USA	English	Undergrad	437
[4]	Public Speaking	USA	English	Undergrad	542
[5]	Communicat. Studies	USA	English	Undergrad	434
[6]	Communicat. Studies	USA	English	Undergrad	232
[7]	Communicat. Studies	USA	English	Undergrad	187
[8]	Multidiscipline	USA	English	Undergrad	375
[9]	Multidiscipline	USA	English	Undergrad	345
[10]	Communicat. Studies	USA	English	Undergrad	170
[11]	Not Specified	USA	English	Undergrad	351
[12]	Communicat. Studies	USA	English	Undergrad	416
[13]	Multidiscipline	USA	English (Int.Students)	Undergrad	121
[14]	Multidiscipline	China	Mandarin	Undergrad	641
[15]	Educ. Technol.	USA	English	Graduate	22
[16]	Marxist Principles	China	Mandarin	Undergrad	284
[17]	Mathematics	China	Mandarin	Undergrad	305

C. Students' Learning

Research question three asked about the influence of CCC on students' learning. A variety of studies have examined the influence of CCC toward students' learning, and in general results have been positive. Research has approached students' learning from a variety of perspectives, including cognitive learning [3, 6] affective learning [3, 6, 7], and self-regulated learning [5, 7]. Despite much positive recognition of CCC, nearly all research has been based upon self-report measures of learning. For example, a 2-item cognitive learning assessment measuring *learning loss,* which describes the difference between how much one believes they learned and how much one believes they could have learned with the ideal instructor [3]. In contrast, the secondary approach to cognitive learning was based upon a 10-item instrument addressing students' recall, knowledge, understanding, and development of skills [6]. No research on students' learning has been conducted in technology-mediated environments. Future research is needed to provide more robust and scientific evidence of student learning outcomes, particularly in ways that utilize observational data both within F2F and technology-mediated environments.

D. Students' Communication and Behavior

Research question four queried the influence of CCC on students' communication and behavior. Among the research examining students' communication and behavior, almost all studies have shown positive results. CCC has shown positive associations with students' classroom assimilation [10], participation [7], and in-class involvement [5, 7]. CCC has also been observed to reduce students' communication anxiety [2] and improve self-perceived language competence [13]. In contrast, students' self-disclosures [11] rapport [6], and classroom citizenship behavior [12] have shown positive influence toward CCC. Similar to the topic students' learning, research has mostly relied on self-report data, with little to no qualitative support or measurement based on observational data. The primary emphasis of research focused toward short term (one semester or less) on-campus experiences, with the only exception being exploration of CCC influencing cloud classroom adoption [16]. Additional research is needed to understand how CCC relates to off-campus, out-of-classroom, and online human experiencing. Additionally, longitudinal research is needed to interpret the effects of CCC on longer-term issues such as student retention and degree completion.

E. Instructors' Communication and Behavior

Research question five investigated the influence of CCC on instructors' communication and behavior. Research shows that higher levels of CCC can affect instructors' behavior, such as the willingness to comply with students' requests [8]. Conversely, instructors' communication and behavior, including their confirmations [5] and rapport [6], can positively influence CCC. Furthermore, some evidence shows that CCC can positively influence student learning regardless of instructors' behavior. For example, through the mediation between instructor apathy and students' self-regulated learning and willingness to talk in class [7]. CCC also mediated relationships between other instructor misbehaviors (e.g., irresponsibility and derisiveness) to self-regulated learning [7]. These findings suggest that positive student learning outcomes can be achieved through high levels of CCC regardless of instructors' behavior. In general, less research has examined CCC from the instructors' perspective, in comparison to CCC from the students' perspective. No research has examined the influence of CCC toward topics such as instructors' motivation, job satisfaction, attitudes, and acceptance of new educational technologies or pedagogical approaches.

IV. CONCLUSION

Since the introduction of the Connected Classroom Climate Inventory [1] in 2004, it has become evident that CCC is a positive force that enables student well-being and academic success. CCC has shown positive associations with an array of benefitial student learning outcomes, and has been observed as supportive in sub-optimal instructional conditions. The most recent CCC research is trending toward technology-mediated learning environments, and it should be expected that CCC will be even more critical under such conditions, which require at least a partial absence of traditional F2F instructional support. However, regardless of instructional delivery method, all researchers, practitioners, and administrators should be considering ways to design strategies, programs, pedagogies, and curriculum that promote CCC in higher education.

ACKNOWLEDGMENT

This work was partially sponsored by Major Breeding Project of CCNU 2014 Fundamental Research (Humanities and Social Sciences) (CCNU14Z02006).

REFERENCES

[1] K.K. Dwyer et al., "Communication and connectedness in the classroom: Development of the connected classroom climate inventory," Commun. Res. Rep., vol 21, pp. 264–272, 2004.

[2] R.E. Carlson et al., "Connected classroom climate and communication apprehension: Correlations and implications of the basic course," Basic Commun. Course Annual, vol 18, pp. 1–27, 2006.

[3] M. Prisbell et al., "Connected classroom climate and communication in the basic course: Associations with learning," Basic Commun. Course Annual, vol. 21, pp. 151–172, 2009.

[4] S.G. Bingham et al., "Student misbehaviors, instructor responses, and connected classroom climate: Implications for the basic course," Basic Commun. Course Annual, vol. 21, pp. 30–68, 2009.

[5] R.J. Sidelinger, and M. Booth-Butterfield, "Co-constructing student involvement: An examination of teacher confirmation and student-to-student connectedness in the college classroom," Commun. Educ., vol. 59, pp. 165–184, 2010.

[6] B.N. Frisby, and M.M. Martin, "Insrtuctor-student and student-student rapport in the classroom," Commun. Educ., vol. 59, pp. 146–164, 2010.

[7] R.J. Sidelinger et al., "When instructors misbehave: An examination of student-to-student connectedness as a mediator in the college classroom," Commun. Educ., vol. 60, pp. 340–361, 2011.

[8] R.J. Sidelinger et al., "Instructor compliance to student requests: An examination of student-to-student connectedness as power in the classroom," Commun. Educ., vol. 61, pp. 290–308, 2012.

[9] D.I. Johnson, "Student in-class texting behavior: Association with instructor clarity and classroom relationships," Commun. Res. Rep., vol. 30, pp. 57–62, 2013.

[10] M. Sollitto, Z.D. Johnson, and S.A. Myers, "Students' perceptions of college classroom connectedness, assimilation, and peer relationships," Commun. Educ., vol. 62, pp. 318–331, 2013.

[11] Z.D. Johnson, and S. LaBelle, "Examining the role of self-disclosure and connectedness in the process of instructional dissent: A test of the instructional beliefs model," Commun. Educ., vol. 64, pp. 154–170, 2015.

[12] S.A. Myers et al., "Student civility in the college classroom: Exploring student use and effects of classroom citizenship behavior," Commun. Educ., vol. 65, pp. 64–82, 2016.

[13] C.-F., Hsu, and I.-T. Huang, "Are international students quiet in class? The influence of teacher confirmation on classroom apprehension and willingness to talk in class," J. Int. Students, vol. 7, 38–52, 2017.

[14] J. MacLeod, H.H. Yang, S. Zhu, and Y. Shi, "Technological factors and student-to-student connected classroom climate in cloud classrooms," J. Educ. Comput. Res., 2017. (online first)

[15] J. Xu, H.H. Yang, and J. MacLeod, "STEP on connected classroom climate in a hybrid learning environment," Int. J. Innov. Learn., vol. 23, pp. 430–443, 2018. (online first)

[16] H.H. Yang, L. Feng, and J. MacLeod, "Understanding students' acceptance of cloud classrooms: Integrating UTAUT and connected classroom climate," J. Educ. Comput. Res., 2018. (online first)

[17] Y. Li, H.H. Yang, J. MacLeod, and J. Dai, "Developing the rotational synchronous teaching (RST) model: Examination of the connected classroom climate," Australasian J. Educ. Technol., in press.

[18] J. Gibb, "Defensive communication," J. Commun., vol. 11, pp. 141–148, 1961.

[19] D. Baumrind, "Effects of authoritative parental control on child behavior," Child Develop., vol. 37, pp. 887–907, 1966.

[20] F. Merrett, and K. Wheldall, "How do teachers learn to manage classroom behavior? A study of teachers' opinion about their initial training with special reference to classroom behavior management," Educ. Studies, vol. 19, pp. 91–106, 1993.

[21] C.C. Bonwell, and J.A. Eison, "Active learning: Creating excitement in the classroom," ASHE-ERIC Higher Educ. Report, 1991.

[22] Partnership for 21st Century Learning, "Framework for 21st century learning," http://www.p21.org/our-work/p21-framework.

[23] B.M. Hagerty et al., "An emerging theory of human relatedness," J. Nursing Scholar., vol. 25, pp. 291–196, 1993.

[24] D.I. Johnson, "Connected Classroom Climate: A validity study," Commun. Res. Rep., vol. 26, pp. 146–157, 2009.

[25] R.J. Sidelinger et al., "Academic and social integration in the basic communication course: Predictors of students' out-of-class communication and academic learning," Commun. Studies, vol. 66, pp. 63–84, 2015.

[26] R.F. Baumeister, and M.R. Leary, "The need to belong: Desire for interpersonal attachments as a fundamental human motivation," Psy. Bulletin, vol. 117, pp. 497–529, 1995.

[27] M.B. Horn, and H. Staker, "Blended: Using distruptive innovation to improve schools," California: Jossey-Bass, 2015.

[28] J. Webster, and R.T. Watson, "Analyzing the past to prepare for the future: Writing a literature review," MIS Quarterly, vol. 26, pp. 13–23, 2002.

[29] H. Arksey, and L. O'Malley, "Scoping studies: Towards a methodological framework," Int. J. Social Res. Method., vol. 8, pp. 19–32, 2005.

[30] J. O'Flaherty, and C. Phillips, "The use of flipped classrooms in higher education: A scoping review," Internet High. Educ., vol. 25, pp. 85–95, 2015.

[31] J. Xu, H. H. Yang, and J. MacLeod, "Connected classroom climate in hybid classroom: Model and comparison," in Int. Conf. Blended learning, S.K.S. Cheung et al. Eds., Switzerland: Springer, pp. 187–195, July 2016.

[32] A.S. Sağkal, Z.T. Kabasakal, and A. Türnüklü, "Turkish adaption of the Connected Classroom Climate Inventory (CCCI)," Elementary Educ. Online, vol. 14, pp. 1179–1192, 2015.