Active Online Learning: Supporting Collaboration and a Sense of Community in Undergraduate Mathematics

Joel Wiebe, University of Toronto;
Yanhong Li, Ludwig-Maximilians-Universität München; Jinjun Dai, CCNU;
Xinli Wang, University of Toronto;
James D. Slotta, University of Toronto

Abstract

Previous studies have shown that active learning in classroom contexts improves student engagement, motivation, and performance. However, recent changes to the educational landscape, resulting from the COVID-19 pandemic, have constrained many classes to online environments. Our study investigated how we could support active online learning with a learning community approach. We redesigned an activity for active learning classrooms, called Community Supported Worksheets (CSW), as an online activity. Results show how learning community pedagogy can be applied online to support group and whole-class interactions and individual learning in undergraduate mathematics. Challenges of asynchronous collaboration within this context are briefly discussed. This study serves to grow our understanding of how to develop flexible active learning patterns and provides implications for future iterations.

Introduction

Active learning, broadly defined as the infusion of student activities into lecture, has grown internationally as a normative instructional practice in K-12 and higher education (Bonwell & Eison, 1991; Freeman et al., 2014; Prince, 2004). Active learning is commonly linked to increased engagement, information retrieval (Prince, 2004; Beichner, 2008), improved student outcomes on exams and course grades (Freeman et al., 2014; Talbert & Mor-Avi, 2018), and deeper conceptual understandings (Beichner, 2008; Dori & Belcher, 2005). This approach is complemented by active learning classrooms (ALCs), learning spaces designed to combine lecture, student activities, and technology-rich learning (Beichner, 2008; Beichner et al., 1999; Wilson & Jennings, 2000). A range of different active learning approaches and strategies are associated with these spaces, e.g., collaborative learning (Barkley et al., 2014), problem-based learning (Grabinger & Dunlap, 2002), peer-instruction (Mazur, 1997), jigsaw (Perkins & Saris, 2001), and peer-assessment (Sluijsmans et al., 1998). ALCs, therefore, rely on a combination of physical space, technology, and activities. However, ALCs have been disrupted by the COVID-19 outbreak, that has led to over 1.5 billion learners globally being unable to return to their schools (UNESCO, 2020). Instructors who value active learning approaches have thus been challenged in developing *flexible* online learning experiences (e.g. Huang, et al., 2020; Reynolds & Chu, 2020). Despite challenges of teaching and learning online, the notion of *active online learning* (Dringus, 2000; Phillips, 2005; Salmon, 2004) is gaining attention as educators strive to improve effectiveness and engagement of online learning (e.g. Bao, 2020; Tan et al., 2020).

Research Purpose

This study investigates how patterns and principles of active learning can be migrated into the online space, to maintain and support students' sense of community, collaboration, and inquiry in undergraduate mathematics. This study investigates an activity called Community Supported Worksheets (CSW), developed over the past two years for mathematics, for the context of face-to-face, synchronous learning in an active learning classroom (Li et al., 2020). We re-designed the activity, and developed new technology infrastructure to support the scripting and orchestration of a complex inquiry pattern (Slotta, Quintana, & Moher, 2018).

A key research question is concerned with the application of a learning community approach to support active learning. Learning communities have been studied as a powerful pedagogy of engagement and peer support, with a distinct epistemological perspective of collective inquiry and progress (Scardamalia & Bereiter, 1994; Slotta, Quintana, & Moher, 2018). Our initial work, performed in active learning classrooms, sought to unify all students in the class, aligning their work to support the progress of the community as a whole, with the community serving as a central resource for each individual's learning. We sought to maintain this focus in our move to the online format. Hence our specific research questions are as follows:

1. How can a learning community pedagogy be applied to support whole-class interactions and individual learning activities in an undergraduate mathematics context?
2. What are the opportunities within a mathematics learning activity that allow students to support their peers and gain a sense of the value of the community?
3. What forms of exchange amongst students in a learning community are the most productive for student progress in undergraduate mathematics?

Method

Participants and Data description

This study took place in the Spring of 2020, with 302 students, self-selected from a larger sample of 1500 undergraduate students in a linear algebra course, offered at a large university in central China. These students were in COVID-19-related lockdown at the time. The instructor is a veteran of active learning methods and experienced in teaching large cohorts online (Li et al., 2020). This paper includes data from two enactments of the Community-Supported Worksheet (CSW) activity (described below). The database included 8216 records of data, representing student responses of various types (e.g. discussion posts, open responses, and multiple choice responses).

In this study, students were randomly divided into ten virtual classrooms, and then randomly assigned to five student groups. The virtual classes contained an average of 29.85 students (*SD* = 5.00, range 17 to 37). The group sizes were on average 5.97 students (*SD* = 2.27, range 2 to 11). In total, 284 students participated in the first run and 265 students participated in the second run.

Activities and Materials

The CSW pattern involves three successive linear algebra problems (see Figure 1), two solved collaboratively amongst small groups, one of which is impossible for most groups, thus requiring support from the community in the form of hints. The third question is a transfer problem, attempted individually. The CSW pattern, therefore, comprises 4 components (1) a group discussion to support peers' understandings of the problem, (2) an individual attempt that aims to foster desirable difficulty (Bjork, 1994) through individual struggle, (3) a group level negotiation of individually generated answers, and (4) a whole-class hint board to generate, rate, and comment on hints to support all classmates to make progress. A post-study survey with both open and multiple choice questions was administered to elicit information about students' feelings of connectedness, enjoyment, whether tasks were helpful, and whether they benefited from their peers. The CSW pattern was run twice with the same class of students. A survey was administered at the end of each run.

To support our research, we required a more nuanced control of student grouping and materials than is available through most eLearning environments. Therefore, in our broader program of research, we have developed a SCripting and ORchestration Environment (SCORE) that allows for fine control of student grouping, materials, and activities (see Figure 2).

Variables and Indicators

A description of variables and indicators is shown in Table 1. To address our research questions, we have reframed each in terms of the present study, to obtain specific indicators relating to the CSW pattern:

1. What factors affect students' successful completion of collaborative worksheets?
2. Which factors within CSW affect students' sense of connectedness?
3. What are the characteristics of an effective hint for CSW?

Data Analysis

To address the hierarchical structure of the data in this study (i.e. multiple individuals per group and multiple groups per class), the multilevel modeling (MLM; Peugh, 2010) approach was used for statistical analyses. MLM is used to address the questions about relationships between the variables when the assumption of independence is violated. This assumption is naturally violated in nested data structures, therefore, MLM is an appropriate analytic strategy for this study.

Results

Predictors of Successful Completion

Two outcomes were associated with the successful completion of the worksheets: (1) whether the final answer was achieved and (2) the perceived difficulty when solving this problem. Grading of students' answers became unavailable for this study, but results regarding perceived challenge were analyzed. To investigate whether the perceived challenge of a problem was affected by the group size and whether the difficulty of questions acts as a moderator of this relationship, a 4-level MLM was performed, with the perceived challenge of a problem as an outcome (see Figure 3).

Group size had no significant effect on the perceived difficulty of the worksheets (see Table 2). Specifically, the effect of group size was nonsignificant for worksheet 1 (the easiest one), $B = -.008$, $SE = .027$, $p = .766$. The interaction effects were non-significant as well: $B = .006$, $SE = .033$, $p = .863$ for Group*Worksheet 2 interaction, and $B = .008$, $SE = .034$, $p = .811$ for Group*Worksheet 3 interaction. However, as expected, the second worksheet (more difficult) had a significantly higher average value for the perceived challenge of a problem as compared to Worksheet 1, $B = 1.104$, $SE = .218$, $p < .001$. Similarly, Worksheet 3 was perceived as significantly more difficult than Worksheet 1 ($B = 1.68$, $SE = .222$, $p < .001$).

Predictors of Students' Sense of Connectedness

Similar MLM models were used to explore indicators of students' sense of connectedness. The results provide insight into the relationships of group size and the number of posts with perceived sense of connectedness. The results of our analyses (see Table 3) show a non-significant relationship between the group size and sense of connectedness with peers ($B = -.016$, $SE = .029$, $p = .590$) and that the frequency of posts is not related to the perception of connectedness for discussion of worksheets ($B = -.014$, $SE = .015$, $p = .371$), the collective upload ($B = -.012$, $SE = .015$, $p = .399$), or hint posts ($B = .017$, $SE = .018$, $p = .358$).

Characteristics of Useful Hints

Characteristically, hints were generally brief with references to rules, laws, or particular steps of a solution (see Figure 4). Usefulness of hints was investigated through an open response survey item. Students who reported affirmatively in the survey to whether hints were helpful described hints as: useful tips to get started, reminders of course materials, identifiers of errors, or collisions of ideas from different perspectives. Those who found hints unhelpful stated that there were too few hints at the time (as hints were contributed gradually by classmates), hints were too vague, general, or specific (as a few hints included the answer), students used additional social media to discuss with peers, or students were unsure whether others' hints were correct.

Discussion

Prior to beginning the study, many of the students had reported wanting more opportunity to interact with their peers over their pre-existing online learning experience which was mostly lecture-based. The transition to both online and asynchronous formats appears to have reduced the effectiveness of the CSW script in a few ways. Due to the conflicting schedules of students, we were forced to adopt a flexible, asynchronous format that transitioned us away from the intended synchronous format.

At these early iterations of implementation, contrary to expectations (Rettie, 2003; Stangor, 2004), results show that group size did not have an effect on perceived difficulty or sense of connectedness. This suggests that the outcomes are related to individual differences rather than differences at the group level. This finding that group size has limited impact on other variables can be explained in part by the relatively low response rate among peers within each group. This highlights the importance of additional group process supports to encourage and scaffold the collaborative aspects of this activity in future iterations.

This study has served to step our understanding forward toward developing a flexible active learning pattern, including a technology environment that can support and be readily adapted to a variety of formats (i.e., single classroom, multiple classrooms, fully online, or hybrid). Future research will add additional scaffolds associated with high levels of collaboration (Vogel et al., 2017), e.g., explaining (Webb et al., 2009), questioning (King, 1998), and arguing (Andriessen et al., 2003). We may also compare performance across synchronous and asynchronous enactments. Hints will be revisited to help students target both general tips (such as laws or rules), as well as more specific, procedural hints (as requested by students in this current study).

This research joins the growing effort to develop solutions to the challenging new context of interrupted education and hybrid learning contexts. We seek to develop active learning and social engagement opportunities that are robust toward current and future threats (e.g. natural disasters, pollution-based threats, pandemics, civic unrest, etc.). Although further design and development is required, our approach aims to bring both active learning pedagogy and bespoke technology environments to address the emerging needs of classes moving to online or hybrid environments, seeking means of student engagement, collaboration, and community.

References

Andriessen, J., Baker, M., & Suthers, D. (2003). Argumentation, computer support, and the educational context of confronting cognitions. In J. Andriessen, M. Baker, & D. Suthers (Eds.), *Arguing to Learn: Confronting Cognitions in Computer-Supported Collaborative Learning Environments* (pp. 1–25). Springer Netherlands. https://doi.org/10.1007/978-94-017-0781-7_1

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Barkley, E. F., Cross, K. P., & Cross, K. P. (2014). *Collaborative Learning Techniques: A Handbook for College Faculty*. John Wiley & Sons, Incorporated. http://ebookcentral.proquest.com/lib/utoronto/detail.action?docID=1745058

Beichner, R. (2008). The SCALE-UP Project: A student-centered active learning environment for undergraduate programs. *An invited white paper for the National Academy of Sciences*.

Beichner, R., Bernold, L., Burniston, E., Dail, P., Felder, R., Gastineau, J., ... & Risley, J. (1999). Case study of the physics component of an integrated curriculum. *American Journal of Physics*, *67*(1), 16-S24.

Bjork, R. A. (2017). Creating desirable difficulties to enhance learning. In I. Wallace & L. Kirkman (Eds), *Best of the Best: Progress.* Crown House Publishing.

Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom. 1991 ASHE-ERIC Higher Education Reports*. ERIC Clearinghouse on Higher Education, The George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183. https://eric.ed.gov/?id=ED336049

Dori, Y. J., & Belcher, J. (2005). How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts? *The Journal of the Learning Sciences*, *14*(2), 243–279.

Dringus, L. P. (2000). Towards active online learning: A dramatic shift in perspective for learners. *The Internet and Higher Education*, *2*(4), 189–195. https://doi.org/10.1016/S1096-7516(00)00023-3

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, *111*(23), 8410-8415.

Grabinger, S., & Dunlap, J. C. (2002). Problem-Based Learning as an Example of Active Learning and Student Engagement. In T. Yakhno (Ed.), *Advances in Information Systems* (pp. 375–384). Springer. https://doi.org/10.1007/3-540-36077-8_39

Huang, R. H., Liu, D. J., Tlili, A., Yang, J. F., Wang, H. H., et al. (2020). *Handbook on Facilitating Flexible Learning During Educational Disruption: The Chinese Experience in Maintaining Undisrupted Learning in COVID-19 Outbreak*. Beijing: Smart Learning Institute of Beijing Normal University.

King, A. (1998). Transactive Peer Tutoring: Distributing Cognition and Metacognition. *Educational Psychology Review*, *10*(1), 57–74.

Li, Y., Dai, J., Wang, X., & Slotta, J. D. (2020). Active learning designs for calculus II: A learning community approach for interconnected smart classrooms. *International Journal of Smart Technology and Learning*.

Mazur, E. (1997). *Peer instruction: A user's manual*. Prentice Hall.

Perkins, D. V., & Saris, R. N. (2001). A “Jigsaw Classroom” Technique for Undergraduate Statistics Courses. *Teaching of Psychology*, *28*(2), 111–113. https://doi.org/10.1207/S15328023TOP2802_09

Peugh, J. L. (2010). A practical guide to multilevel modeling. *Journal of School Psychology*, *48*(1), 85–112. https://doi.org/10.1016/j.jsp.2009.09.002

Phillips, J. M. (2005). Strategies for Active Learning in Online Continuing Education | Ovid. *The Journal of Continuing Education in Nursing*, *36*(2), 77–83.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223-231.

Rettie, R. (2003). Connectedness, awareness, and social presence. Paper presented at the *6th International Presence Workshop*, Aalborg, Denmark.

Reynolds, R., & Chu, S. K. W. (2020). Guest editorial. *Information and Learning Sciences*, *121*(5/6), 233–239. https://doi.org/10.1108/ILS-05-2020-144

Salmon, G. (2004). *E-Tivities: The Key to Active Online Learning*. Routledge. https://doi.org/10.4324/9780203646380

Slotta, J. D., Quintana, R. M., & Moher, T. (2018). Collective inquiry in communities of learners. In *International Handbook of the Learning Sciences* (pp. 308-317). Routledge.

Sluijsmans, D., Dochy, F., & Moerkerke, G. (1998). Creating a Learning Environment by Using Self-, Peer- and Co-Assessment. *Learning Environments Research*, *1*(3), 293–319. https://doi.org/10.1023/A:1009932704458

Scardamalia, M., & Bereiter, C. (1994). Computer Support for Knowledge-Building Communities. *Journal of the Learning Sciences*, 3(3), 265–283. https://doi.org/10.1207/s15327809jls0303_3

Stangor, C. (2004). *Social groups in action and interaction*. Psychology Press.

Talbert, R., & Mor-Avi, A. (2018). A space for learning: A review of research on active learning spaces. https://doi.org/10.31235/osf.io/vg2mx

Tan, H. R., Chng, W. H., Chonardo, C., Ng, M. T. T., & Fung, F. M. (2020). How Chemists Achieve Active Learning Online During the COVID-19 Pandemic: Using the Community of Inquiry (CoI) Framework to Support Remote Teaching. *Journal of Chemical Education*. https://doi.org/10.1021/acs.jchemed.0c00541

United Nations Educational, Scientific, and Cultural Organization (UNESCO). (2020). COVID-19 Educational Disruption and Response. https://en.unesco.org/themes/education-emergencies/coronavirus-school-closures

Vogel, F., Wecker, C., Kollar, I., & Fischer, F. (2017). Socio-Cognitive Scaffolding with Computer-Supported Collaboration Scripts: A Meta-Analysis. *Educational Psychology Review*, *29*(3), 477–511. https://doi.org/10.1007/s10648-016-9361-7

Webb, N. M., Franke, M. L., De, T., Chan, A. G., Freund, D., Shein, P., & Melkonian, D. K. (2009). 'Explain to your partner': Teachers' instructional practices and students' dialogue in small groups. *Cambridge Journal of Education*, *39*(1), 49–70. https://doi.org/10.1080/03057640802701986

Wilson, J. M., & Jennings, W. C. (2000). Studio courses: How information technology is changing the way we teach, on campus and off. *Proceedings of the IEEE*, *88*(1), 72-80.

Tables

Table 1

Description of Indicators and Variables

Indicators and Variables	Description
Successful Completion	The successful completion of the collaborative worksheets is explored in terms of two indicators: (1) whether a correct final answer was reached and (2) the student reported perceived difficulty while attempting the question.
Sense of Connectedness	Students' sense of connectedness during the CSW pattern as compared to their previous online learning was self-reported on a 5-point Likert scale.
Difficulty	Each CSW pattern contains three algebra problems: (1) an "easy" collaborative problem, (2) a "difficult" collaborative problem, and (3) a "difficult" transfer problem, worked on individually.
Number of Posts	The number of posts is calculated separately for the (1) student group worksheet discussion, (2) student group collective upload of answers and negotiation, and (3) hints across an entire class.
Group Size	Each class was randomly divided into five groups, the group size reflects this student group size.
Perceived Challenge	After the initial worksheet discussion, students individually attempted the problem and self-reported the difficulty on a 5-point Likert scale.

Table 2

Results from MLM Analysis for Perceived Difficulty

Predictors (of perceived difficulty)	**Interaction Effects**		
	B	*SE*	*p*
Group size * worksheet 1 (easy)	-.008	.027	.766
Group size * worksheet 2 (difficult)	.006	.033	.863
Group size * worksheet 3 (difficult)	.008	.034	.811

Note: * *p*<.05 ***p*<.01 ****p*<.001

Table 3

Results of MLM Analysis for Sense of Connectedness

Worksheet section	**Predictor**	**Interaction Effects**		
		B	*SE*	*p*
--	Group size	-.016	.029	.590
Discussion worksheet	Number of posts	-.014	.015	.371
Collective Upload	Number of posts	-.012	.015	.399
Hints	Number of posts	.017	.018	.358

Note: * *p*<.05 ***p*<.01 ****p*<.001

Figures

Figure 1

Three Consecutive Algebra Problems

小组活动 (Collective Activity)

1. 上传你的答案（部分或完整）(Upload your answer in partial or completed).
2. 评论并给你的小组同伴点赞 (Comment on and upvote your peers' answers).
3. 上传你的最终答案图片 (Upload a picture of your final answer).

手稿问题 (Worksheet Question)

上传你的答案。评论并给你的小组同伴点赞 (Upload your answer. Comment and upvote on your peers' answers).

小组活动 (Collective Activity)

1. 上传你的答案（部分或完整）(Upload your answer, partial or completed).
2. 评论并给你的小组同伴点赞 (Comment on and upvote your peers' answers).
3. 需要提示吗？提示由同级创建后，请转到下一步查看提示。 > (Need a hint? Go to the next step to view hints once they are created by your peers. >)
4. 上传你的最终答案图片 (Upload a picture of your final answer).

手稿问题 (Worksheet Question)

上传你的答案。评论并给你的小组同伴点赞 (Upload your answer. Comment and upvote on your peers' answers).

使用说明 (Instructions)

欢迎使用第三个手稿问题。 这是您的最后一个问题。请单独尝试 (Welcome to Worksheet 3. This is your final question. Please attempt individually.)

你认为这个问题的难度怎么样？(How challenging is this problem?)

你能描述一下你为什么会觉得解答这个问题比较困难吗？ (Can you describe any difficulties you are having?)

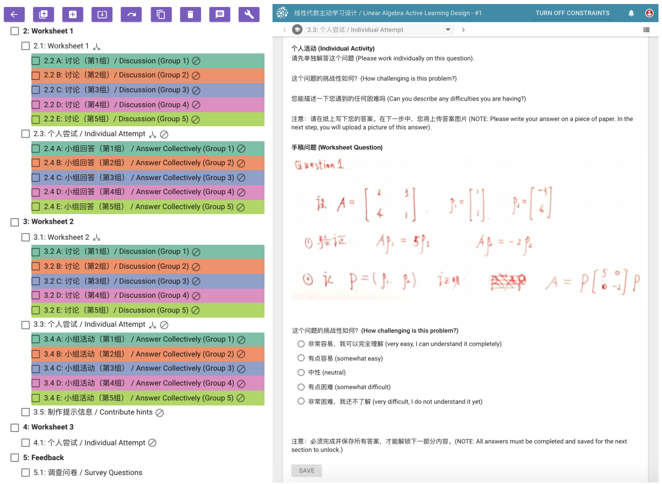
手稿问题三 (Worksheet Question)

你认为这个问题的难度怎么样？(How challenging is this problem?)

Note. The first two are collaborative problems (one easy, then one difficult) and an individually attempted transfer problem.

Figure 2

SCORE Authoring Tool and Learning Environment



- ☐ **2: Worksheet 1**
  - ☐ 2.1: Worksheet 1
    - ☐ 2.2 A: 讨论（第1组）/ Discussion (Group 1)
    - ☐ 2.2 B: 讨论（第2组）/ Discussion (Group 2)
    - ☐ 2.2 C: 讨论（第3组）/ Discussion (Group 3)
    - ☐ 2.2 D: 讨论（第4组）/ Discussion (Group 4)
    - ☐ 2.2 E: 讨论（第5组）/ Discussion (Group 5)
  - ☐ 2.3: 个人尝试 / Individual Attempt
    - ☐ 2.4 A: 小组回答（第1组） / Answer Collectively (Group 1)
    - ☐ 2.4 B: 小组回答（第2组） / Answer Collectively (Group 2)
    - ☐ 2.4 C: 小组回答（第3组） / Answer Collectively (Group 3)
    - ☐ 2.4 D: 小组回答（第4组） / Answer Collectively (Group 4)
    - ☐ 2.4 E: 小组回答（第5组） / Answer Collectively (Group 5)
- ☐ **3: Worksheet 2**
  - ☐ 3.1: Worksheet 2
    - ☐ 3.2 A: 讨论（第1组）/ Discussion (Group 1)
    - ☐ 3.2 B: 讨论（第2组）/ Discussion (Group 2)
    - ☐ 3.2 C: 讨论（第3组）/ Discussion (Group 3)
    - ☐ 3.2 D: 讨论（第4组）/ Discussion (Group 4)
    - ☐ 3.2 E: 讨论（第5组）/ Discussion (Group 5)
  - ☐ 3.3: 个人尝试 / Individual Attempt
    - ☐ 3.4 A: 小组活动（第1组） / Answer Collectively (Group 1)
    - ☐ 3.4 B: 小组活动（第2组） / Answer Collectively (Group 2)
    - ☐ 3.4 C: 小组活动（第3组） / Answer Collectively (Group 3)
    - ☐ 3.4 D: 小组活动（第4组） / Answer Collectively (Group 4)
    - ☐ 3.4 E: 小组活动（第5组） / Answer Collectively (Group 5)
  - ☐ 3.5: 制作提示信息 / Contribute hints
- ☐ **4: Worksheet 3**
  - ☐ 4.1: 个人尝试 / Individual Attempt
- ☐ **5: Feedback**
  - ☐ 5.1: 调查问卷 / Survey Questions

个人活动 (Individual Activity)

请先单独解答这个问题 (Please work individually on this question).

这个问题的挑战性如何？(How challenging is this problem?)

您能描述一下您遇到的任何困难吗 (Can you describe any difficulties you are having?)

注意：请在纸上写下您的答案。在下一步中，您将上传答案图片 (NOTE: Please write your answer on a piece of paper. In the next step, you will upload a picture of this answer).

手稿问题 (Worksheet Question)

这个问题的挑战性如何？**(How challenging is this problem?)**

- ○ 非常容易，我可以完全理解 (very easy, I can understand it completely)
- ○ 有点容易 (somewhat easy)
- ○ 中性 (neutral)
- ○ 有点困难 (somewhat difficult)
- ○ 非常困难，我还不了解 (very difficult, I do not understand it yet)

注意：必须完成并保存所有答案，才能解锁下一部分内容。(NOTE: All answers must be completed and saved for the next section to unlock.)

Note. SCORE authoring tool (left) and student learning environment (right).

Figure 3

MLM of Group Size as a Predictor of Perceived Challenge

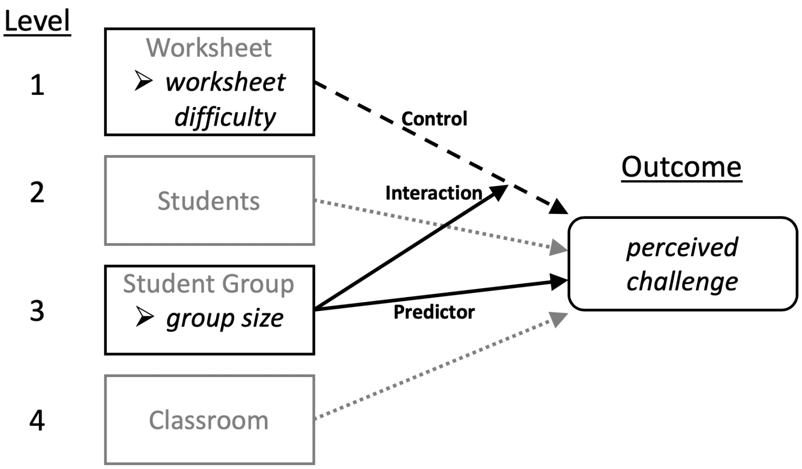
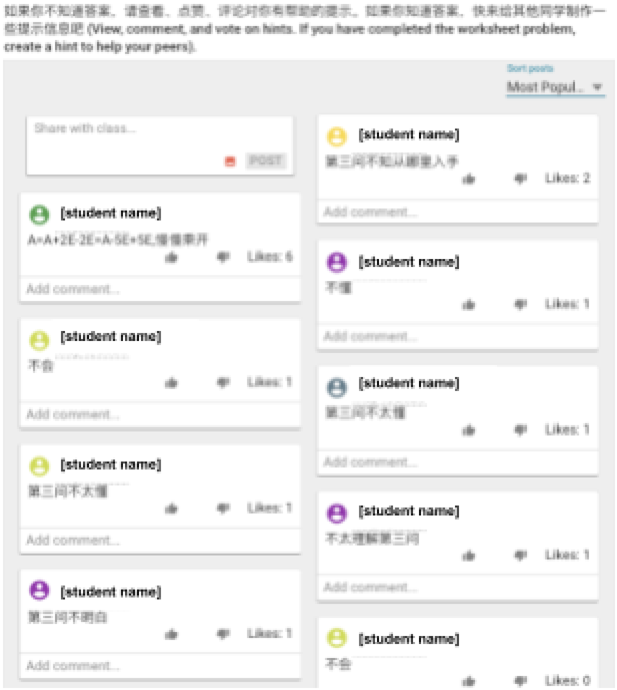


Figure 4

Whole-class Hint Board for Difficult Collaborative Problem



如果你不知道答案，请查看、点赞、评论对你有帮助的提示。如果你知道答案，快来给其他同学制作一些提示信息吧 (View, comment, and vote on hints. If you have completed the worksheet problem, create a hint to help your peers).

[student name]
A=A+2E-2E=A-5E+5E,慢慢乘开
Likes: 6

[student name]
不会
Likes: 1

[student name]
第三问不太懂
Likes: 1

[student name]
第三问不明白
Likes: 1

[student name]
第三问不知从哪里入手
Likes: 2

[student name]
不懂
Likes: 1

[student name]
第三问不太懂
Likes: 1

[student name]
不太理解第三问
Likes: 1

[student name]
不会
Likes: 0

Note. Most notes are written in Chinese.