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Peer learning and learning-oriented assessment in technology-enhanced environments

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Group work, group projects and collaborative learning encourage students to learn from other students as well as from the lecturer. Peer learning may involve cooperation, communication and the giving and receiving of peer feedback. In addition peer learning emphasises the sharing of knowledge and ideas between students in a reciprocal partnership. However, some educators ask individual students to formally assess each other within the context of a group project which may inhibit the very process of peer learning that they are attempting to promote. This paper, through the voices of three lecturers and their students, has attempted to reinforce the importance of learning-oriented peer assessment within technology-enhanced environments. This paper advocates the concept of learning-oriented peer assessment strategies to enhance student learning.

Introduction

University teachers need to make many decisions to encourage meaningful student learning and develop broader forms of social, cultural and intellectual capability. Meaningful learning emphasises active, constructive, intentional, authentic and cooperative learning (Jonassen *et al.*, 2003). Peer learning is one method to encourage meaningful learning which involves students teaching and learning from each other. It involves a sharing of ideas, knowledge and experiences and emphasises interdependent as opposed to independent learning (Boud, 2001). Although it would be generally agreed that these goals are important, there are conflicting viewpoints in relation to the best way to implement peer learning in formal university courses or whether peer learning should be informally or formally assessed. In addition it is debatable as to the ideal blend of individual versus peer-related assessment in a course. Boud *et al.* (2001) suggested that careful planning is needed in order for

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assessment to be compatible with peer learning. In addition, the authors' of this paper ask, how do the principles of peer learning transfer to technology-enhanced learning environments where it is not always obvious how to transfer discussion, communication and articulation of ideas to the online learning environment.

This paper addresses the blending of peer learning, assessment and technology-enhanced environments. In particular this paper focuses on assessment strategies that enhance learning which we term learning-oriented assessment (Carless, 2003) practices. Learning-oriented assessment focuses on using assessment strategies to enhance student learning as opposed to validating or certifying learning through summative assessment. As part of this project, simultaneous thought was given to reconceptualising both the learning process and the assessment process (Guile, 1998, p. 24) in order to achieve our goals of learning-oriented assessment. Four university educators were involved in a design-based research project in which they redesigned their courses to utilise peer learning and learning-oriented assessment strategies in a technology-enhanced environment. Three of these cases are examined in this paper.

Peer learning

Peer learning is a 'two-way reciprocal learning activity' (Boud *et al.*, 2001, p. 3) in which there is mutual benefit to the parties involved. The reciprocal nature of the activity is key as students do not hold power over each other by virtue of their position or responsibilities. Because peer learning is bi-directional, it differs from peer tutoring which implies an unequal partnership due to the position of responsibility that one person would hold. Peer learning can be both informal and formal. Informal peer learning occurs implicitly when students discuss lectures, assignments, projects and exams in casual social settings. Formal peer learning occurs when group work or group projects are explicitly scheduled into courses.

Eisen (1999) suggested six qualities of peer partnerships: voluntary involvement, trust, non-hierarchical status, duration and intensity of the partnership leading to closeness, mutuality and authenticity. Although these characteristics are focused on peer partnerships, they also have relevance for peer learning and peer assessment. A major benefit of peer learning is that it promotes a transferable skill that students can apply to other courses and real-world professional settings. Peer learning also promotes lifelong learning and is linked to generic capabilities of teamwork and interpersonal skills that employers view highly (Tan, 2003). On the other hand peer learning is not without its challenges, as lecturers need to consider the context in which it is introduced, the general goals and learning outcomes, the congruence between the peer learning strategies and assessment tasks, and the preparation of both staff and students for the initiative (Boud *et al.*, 2001).

Assessment

Assessment is an integral part of the learning experience for students. It should be about finding out about the quality of students' learning and of teaching more

effectively, as it allows an examination of what the student knows and does not know. Ideally assessment 'encourages interest, commitment and intellectual challenge' (Ramsden, 2003, p. 180). Formative assessment is fundamentally about good teaching and learning through allowing students to improve their performance on the same task. Sadler (1989) suggested that formative assessment included both feedback and self-monitoring. Ramsden's view (2003) is that assessing students is about understanding their learning and its fundamental goal is to improve student learning. Assessment has a key role in teaching and learning because students define the curriculum or module according to the assessment. The assessment also sends explicit and implicit messages to students about what is considered important in the module. Because assessment is such an influence on learning, inappropriately designed assessment can negate its usefulness as a teaching and learning strategy (Boud *et al.*, 2001).

Peer learning requires careful attention to assessment practices so that there is congruency between the activity and the assessment. Peer assessment can be both formal and informal. McLuckie and Topping (2004) suggested a definition of formal peer assessment which involved peers considering the amount, level, value, worth, quality or successfulness of learning outcomes or products contributed by each individual member of the group. The reciprocal nature of peer learning also needs to be considered in peer assessment. As soon as we ask students to assess other students' contribution to a project or group activity (for formal grades) we change the nature of the peer learning relationship, thereby implicitly sending an inappropriate message to students about the focus and value of peer learning. This is why we consider that peer assessment should focus on informal feedback to other students as opposed to formal assessment.

Designing peer learning without considering the backgrounds of both teachers and learners may also be problematic. University teachers need to consider their own prior experience, approaches to teaching, and perceptions of the teaching situation as these affect teaching outcomes (Prosser & Trigwell, 1999). Prosser and Trigwell (1999) also suggest that the student's situation consists of his/her prior experience, approaches to learning, perceptions of his/her situation which will all affect the student's learning outcomes. Peer learning and peer assessment need to account for these teacher and student beliefs during implementation. In addition Laurillard (2002) suggested that learning from 'new media' required an explicit modification of assessment criteria to account for the affordances of the new technology.

Technology-enhanced learning environments

There are three concurrent discourses about ICT (Information and Communications Technologies) which directly impact on assessment. ICT can be viewed as a set of skills or competencies, a vehicle for teaching and learning, or as an agent of change (McFarlane, 2001). The use of ICT as a vehicle for teaching and learning and as an agent of change will be our focus in the three cases. The change from Information Technology (IT) to Information and Communications Technologies (ICT) implies that the user has a more active relationship with the information being interacted with

(Easingwood, 2000, p. 45). ICT is a process of enhancing teaching and learning; a process of empowering learners and equipping students with necessary skills needed for the future (Jonassen *et al.*, 2003). Wang and Kinuthia (2004) define technology-enhanced learning environments as having four characteristics: 'using technology to motivate people, using technology to enrich learning resources, using technology to implement learning and instructional strategies and using technology to assess and evaluate learning goals' (p. 2725). The three cases emphasise each of these characteristics.

Specifically, e-learning strategies offer new opportunities for students to be part of an electronic learning community by interacting on a regular basis (Macdonald, 2004, p. 215). The communicative affordances of e-learning provide new ways to adopt a social constructivist approach to teaching and learning. In these environments discussion, social interaction, collaboration, peer feedback, and group projects can be adopted as teaching and learning strategies. The following three cases describe the use of learning-oriented assessment and the use of peer learning and peer assessment in online learning environments.

Case 1: an electronic assessment design to foster creativity

Students were assigned to a design project (fashion design with fabric and colour illustrations) which involved the use of peer sharing and critique of the group design project using the Blackboard Learning Management System. A study conducted by Thelwall (2000) suggested that computer-based assessment has many advantages including improved learner motivation for study. In addition part of this project involved examining the work of Hennessey and Amabile (1987) who suggested a number of factors that stifle creativity. These included using external rewards, fostering unneeded competition, focusing the students on expected evaluation and using a teacher-controlled approach. With these factors in mind an assessment framework was developed that encouraged intrinsic motivation, collaboration, ongoing assessment and feedback and personal responsibility with the potential of fostering creativity of learners.

This assessment framework consisted of three aspects. Firstly, each group developed the assessment rubrics for their own design works. The criteria were displayed on the module web page for easy reference during the course of module delivery. Secondly, each group completed reflective journals by critically reviewing their own design processes and examining their own learning progress (intra-group review). This reflective journal ensured individual accountability, facilitated group processing and made group dynamics transparent. Learners conducted an intra-group reflection on their design processes, analysed their progress and gave suggestions on methods and strategies to enhance the group's effectiveness through submission of an electronic weekly reflective journal.

> I think the intra-group reflective journal can help us identify our strengths and weaknesses for improved course of action. It also acts as a tool for self-reflection and striving self-enhancement [Focus group with students].

Thirdly, learners critiqued other group design projects by providing feedback throughout the course (inter-group review). Participants also provided feedback to the lecturer about the learning activities. Students suggested that the positive group interactions and encouraging feedback from peers fostered their creativity.

During peer assessment the desired learning outcomes must feature strongly in assessment tasks as assessment practices need to be matched to outcomes (Boud *et al.*, 1999). To foster learners' social skills, creativity and critical reflective capabilities, each group was required to conduct an intra-group reflection which formed the basis of the growth of the group (learning process). Developmental sketches of design works were posted on the Web and participants were then required to provide ongoing critique to other groups as well as perform an inter-group assessment on the final selected piece of design work by giving feedback to the presenter (learning product).

> Peer critique helps us to sharpen our design ideas and to make the sketches more explicit and communicative to the audience. Their positive feedbacks can also train us to be more reflective and serve as a vehicle that can highly motivate us to work out a better piece of work [Focus group with students].

> Peer critique makes us … review our design work. As a result, our final version looks very different from our first draft [see Figure 1]. The improvement is really remarkable! [Focus group with students].

Students were positive about the assessment and suggested:

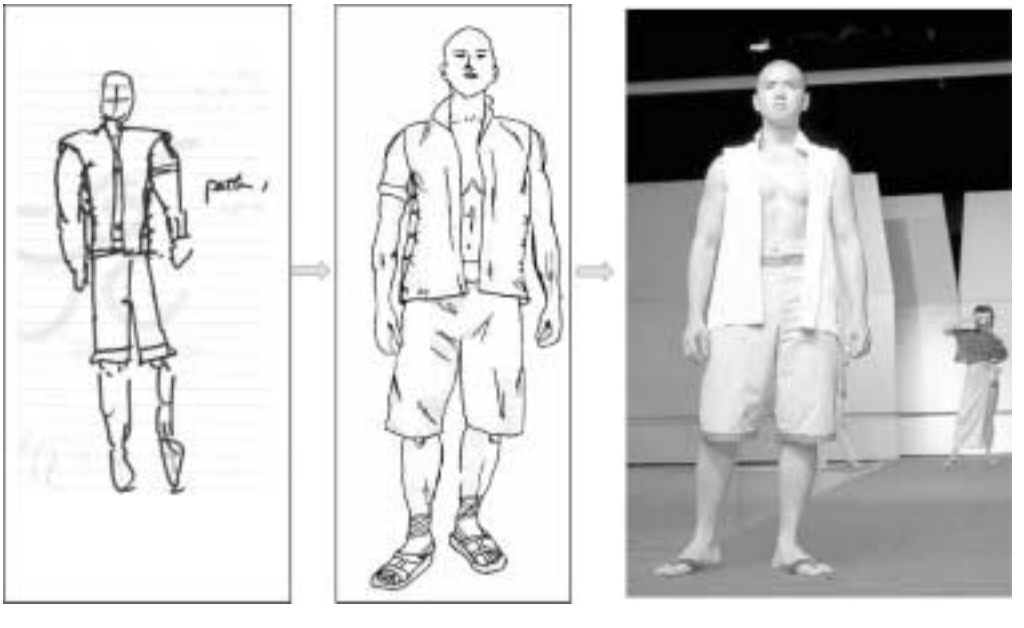

Figure 1. Fashion design illustrating the progression of ideas (after peer feedback) from initial ideas through to the final fashion show

> I think the assessment design is a fairer and more balanced one, which is different from the past with the teacher as the sole assessor. Now, we can obtain reference both from peers and teachers [Focus group with students].
>
> It is not sufficient to have just one summative assessment, as we will not have chances to improve our work. Formative assessments such as writing reflective journals and providing ongoing peer critique can guide us to learn step by step and to learn from trial and error [Focus group with students].

Teacher reflection:

> I think the most important part of that is that it can facilitate a peer critique, sharing, reflection and instant marking (i.e. feedback) … and by giving instant feedback for their refinement for the construction of the knowledge on the creativity of the design.
>
> … Most of my students who had used the online assessment system indicated that the speed of the return of the written comments for refinement and also the increased opportunities for self-reflection and review were identified as the great benefits of the system.
>
> And the rationale for the inclusion of the peer assessment … [is to] enable them to identify others' good practice and they can see the others' work from the markers' point of view so that they can be more self-critical [Video-interview with lecturer].

Case 2: using technology to enhance assessment and learning in Art Education

Within the field of art education, first year participants in the *Art Education Foundation* module were asked to use the Blackboard Learning Management System as part of a learning-oriented assessment strategy. First, they were asked to complete individual reflections as part of the formative assessment. The reflections were submitted to the Discussion Board in Blackboard. The participants' individual assessment tasks included writing a personal metaphor for art teaching, a critique on the 2003 Arts Education Curriculum Guide and reflections on group projects. As the participants received responses from their peers, they could, as the module progressed, make changes in their initial writing. The participants were enthusiastic about gaining feedback from their peers because they regarded the process as open and non-threatening. When responding to each other, the participants interpreted and sometimes challenged the ideas presented by their peers. The following are examples from participants' responses on the Discussion Board:

Initial writing:

> I think an art teacher is just like a light-house … Darkness is just like the situation when students have difficulties … vulnerable and helpless. This is the moment that the teacher can provide direction and assistance. It is just like guiding a ship in a completely dark night (Participant 21, Journal 1, translated).

Response 1:

> Your 'light-house' metaphor is very appropriate for a teacher … However, the teacher's direction may not necessarily be the way where the student wants to go. When such differences occur, the teacher must negotiate with the students … and so a teacher should not be just like a light-house, demanding all 'ships' following its direction (Participant 4, Journal 1, translated).

Response 2:

> As a bright light-house, the teacher's personal knowledge, attributes and philosophy are very important. If the teacher does not have the right attributes or sufficient knowledge, he will not be a good guide. He/she may mislead the students. So students should not just rely on their teachers. At times, they have to learn through failures (Participant 12, Journal 1, translated).

In addition to using the Discussion Board for sharing and responding, the lecturer and participants used digital images and video-cases as an integral part of teaching, learning and assessment in the two group projects. The first project was on school-based art curriculum and the second was on teaching visual culture in secondary schools. The module lecturer used digital images and videos as triggers for problem-based learning. Video-cases were presented to facilitate discussion and problem-finding. In the class sessions, participants worked in groups to identify learning issues from the cases for further inquiry. In their projects, the participants searched the Internet for information, solicited views on visual culture by means of a web survey, recorded students' artwork using digital cameras and videotaped both interviews with teachers and the visual environment of the school. The presentations were uploaded to Blackboard for discussion and reflection.

Although the participants had to complete individual and group tasks for formative assessment, the reflections and findings of group projects were woven into their final assignment. The summative assessment was no longer an end-of-module assignment.

Teacher reflection:

> For example, formative assessment which I have used in this module, students … .also talk about … how useful [it is] because they receive feedback both from me and also from other fellow students. And then the second point I would like to mention is how technology can connect people. It provides connections virtually, so in other words, we can build a learning community very easily without really having to see each other face-to-face [Video-interview with lecturer].

Case 3: designing a Virtual Learning Community

In-service primary school teachers were assigned to a design project that focused on the design of a virtual learning community (VLC) and involved peer learning using face-to-face groups and virtual groups using the Blackboard Learning Management System. Bransford *et al.* (2000) suggested that the quality of feedback can be improved by allowing students to work collaboratively, and that the feedback is particularly useful when students can use it to revise their work on a project. In addition 'feedback is most valuable when students have the opportunity to use it to revise their thinking as they are working on a unit or project' (p. 141). Ongoing peer feedback was an integral part of the module and this level of group discussion and feedback was an assessable component of the module within the group area of the Blackboard LMS. The entire group was assessed on their level and depth of discussion as opposed to individual contributions. Peer assessment and self-assessment may be beneficial when the lecturer wishes to broaden the feedback that

each student receives throughout the course. It also relieves the need for the lecturer to provide constant individual feedback to each student (Dunn *et al.*, 2004).

The assessment framework consisted of three aspects. Firstly, each group completed a rationale which focused on the following questions: Why have you chosen this topic? Why is it a good topic for creating a VLC? What will the student learn in the community? How will the teacher assist the student to learn in your community? What important concepts in the readings are relevant to your community? The discussion about these areas needed to occur within their group project area within Blackboard and aimed to foster peer learning and peer feedback. A draft of the rationale was submitted to the lecturer for feedback mid-way through the writing process to obtain further feedback.

Secondly, each group completed a concept map which portrayed the visual architecture of the virtual learning community for their topic and audience. The group developed the concept map and iterations of the map were exchanged in the file exchange area of the group project area in Blackboard. Often several versions of the map were created after student discussion within the group project area. Design is a creative process that is far from straightforward, and is often iterative and meandering until a final product is developed. Students constructed the map during class time and outside class through the group area of Blackboard. Informal verbal feedback from the lecturer in each class provided guidance to the students and written feedback mid-way through the design provided guidance for the completion of the assessment item. In the design of the concept map of the VLC, students included teacher and student activities (individual, partner, small group and large group activities) to be completed online.

> Before I study this course, I think that to build a real community is a difficult task. Now, I think that to plan for a good community is more difficult, because there a lot of things

The topic of our virtual community is about mathematics. I think there are several reasons why we should choose this topic. There are very few ... virtual communities about teaching and learning mathematics in Hong Kong. That means our virtual community has a large number of potential members. Most of these communities [have] no interaction between teacher and students. Some ... virtual communities about mathematics [are] available in Taiwan, but their syllabus and teaching theory is quite different from Hong Kong. Virtual learning is good for our students because learning should not be confined in the classroom. Students can use the virtual learning community to exchange their ideas outside their school. They can be more 'free' to express their opinions and thinking [Mathsian group project discussion in Blackboard].

Figure 2. Discussion within the group area of the Blackboard LMS about virtual learning communities

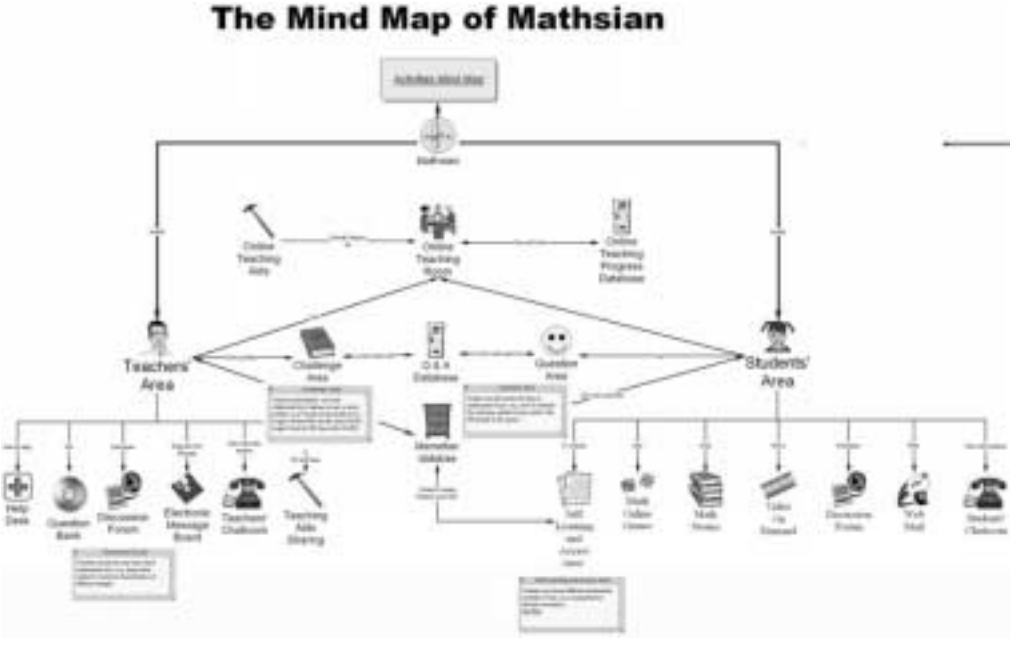

Figure 3. A concept map illustrating the design of a virtual learning community for mathematics

> [we] need to concern [ourselves with] when planning to build a community [Mathsian group project discussion in Blackboard].

The following excerpts illustrate some of the discussion about the design of the concept map.

> I think Question Area is a good idea, do you think so? Students can post a Maths question in the Question Area. This question can be answered by the teacher members. So on the other hand the Teacher Area will have a 'Challenge Area' … to answer student questions. In the Question Area and Challenge Area, there should be tools to draw or enter maths formula or diagrams [Mathsian group project discussion in Blackboard].

> Moreover, I think we need to encourage the teachers … to be a model of good participation in both 'Challenge Area' and 'Question Area' in our community. Therefore, I think it's important for us to create a forum to discuss the participation expectations in our MATHSIAN, hoping those who want to join our community will decide as to whether they are willing to participate in these areas or not. It means our community should include a discussion board and an area which contains activities for self and group assessment [Mathsian group project discussion in Blackboard].

The third aspect of assessment involved implementing the concept map to design resources for the virtual learning community.

> I think the prototype of the community is a test version of the community. You can improve the community later on, based on the effectiveness of the prototype [Mathsian group project discussion in Blackboard].

Teacher reflection:

> One principle used in the module was the concept of constructive alignment: there is curriculum alignment [and] teaching and learning alignment. In addition, there was synergy between the task and the actual assessment and that's how it became a lot more authentic … The other principle used in the module involved making it collaborative and using collaborative ideas in assessment [Video-interview with lecturer].

Implications

We have explicitly encouraged peer learning by utilising peer assessment within each of the three cases described. A major advantage of peer learning is that it encourages students to take responsibility for their own learning by communicating with other students, providing feedback to other students and receiving feedback from other students within the group setting. This lifelong skill is essential in all future work settings. The absence of the staff member as an integral member of the group may also provide them more practice in adopting the reciprocal role. 'Students gain more practice in communicating in the subject area than is typically the case in learning activities when staff are present. They are able to articulate their understanding and have it critiqued by peers as well as learn from adopting the reciprocal role' (Boud *et al.*, 1999 p. 416).

Because formal assessment is a direct indicator of importance within courses, university teachers need to account for this student perception. If we value peer learning, group work and collaboration in our teaching and learning, we need to include peer assessment within the formal assessment for the course. We advocate peer assessment to be formally assessed and suggest that it should be weighted accordingly in the assessment for the course. Unless a group project has a reasonable weighting for the course, i.e. it is a major aspect of assessment, students will not take it seriously. It seems unfortunate that this occurs but the pragmatic nature of students is evident when they begin to prioritise what is important in the course as this directly relates to how much time needs to be committed to the task. We also suggest that learning-oriented assessment is a fundamental component of peer assessment.

It is essential that we do not use peer assessment inappropriately, as it can also inhibit learning and send inappropriate signals to students about the nature of peer learning within groups. Boud *et al.* (1999) suggest that asking students to formally assess each other within the context of a group project can lead to lack of cooperation, as we then 'implicitly or explicitly pit one person against another' (p. 421). We argue that we are sending students inappropriate messages when we ask them to cooperate in a group to create a group project and then turn around and ask them to formally assess the contribution of each individual member within the group. What we need to do is emphasise the group output or collective output and encourage students to provide peer feedback in developing this output. A blended approach to assessment of both group and individual items should appease both students and staff who are concerned about 'freeloaders'. Peer learning and peer assessment are about students providing feedback to each other for the benefit of the collective effort.

By blending learning-oriented assessment, peer learning and online learning, we offered 'new landscapes for learning' (Guile, 1998, p. 23). The three modules used a technology-enhanced environment as a tool to promote and support learning. We found that the unique affordances of the technology supported our teaching and learning and provided another means to obtain and provide feedback, complete group work, encourage collaboration and promote students to reflect on their learning. In addition project-based learning approaches, collaborative group work and the utilisation of online discussion forums provide important avenues for students to discuss, negotiate and obtain peer feedback about their work.

Conclusion

Students involved in group work, group projects and collaborative learning should be encouraged to utilise peer feedback because they can learn from other students and the lecturer. To enhance peer feedback, principles of learning-oriented assessment need to be embedded into group and collaborative learning settings so that we encourage cooperation, communication and the giving and receiving of feedback. This paper, through the voices of three lecturers and their students, has attempted to reinforce the importance of learning-oriented peer assessment. The concept of *learning-oriented peer assessment* may offer a fruitful direction for guiding educators who wish to use peer assessment in pedagogically appropriate ways to foster lifelong learning.

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