Learning Groups in MOOCs

Lessons for Online Learning in Higher Education

Godfrey Mayende
University of Agder, Norway
godfrey.mayende@uia.no

Andreas Prinz
University of Agder, Norway
andreas.prinz@uia.no

Ghislain Maurice Norbert Isabwe
University of Agder, Norway
maurice.isabwe@uia.no

Paul Birevu Muyinda
Makerere University, Kampala, Uganda
mpbirevu@cees.mak.ac.ug

Abstract—when there is interaction within online learning groups, meaningful learning is achieved. Motivating and sustaining effective student interactions requires planning, coordination and implementation of curriculum, pedagogy and technology. For our aim to understand online learning group processes through identification of effective online learning group mechanisms, comparative analysis was used on a massive open online course (MOOC) run in 2015 and 2016. Qualitative (interaction on the platform) and quantitative (survey) methods were used. The findings revealed several possible ways to improve online learning group processes. This paper concludes that course organization helped in increasing individual participation in the groups. Motivation by peers helped to increase sustainability of interaction in the learning groups. Applying these mechanisms in higher education can help making online learning groups effective.

1 Introduction

The proliferation of ICT in teaching and learning has created new possibilities for supporting collaborative and cooperative learning in distance education [1]. Collaborative learning hinges on the belief that knowledge is socially constructed although

each learner has control over his/her own learning. Vygotsky argues that a person's learning may be enhanced through engagement with others. Learning groups have been preferred for propelling interaction and learning. However, motivating and sustaining effective student interactions are not easy to achieve. That requires planning, coordination and implementation of curriculum, pedagogy and technology [2].

Learning groups have been widely used to enhance learning in higher education and more specifically in distance learning. This is done by giving group assignments to help in the initiation of learning groups. However, challenges of co-locating learners and participation of each group member lead to some learners not contributing on the group assignment. Often, their names are still attached to the work. This causes high failure rates at the end during summative assessment [3], since the learners that do not participate, fail to harness the benefits of the rich learning experiences from group members. Therefore, effective ways of engaging learners online can offer possibilities of enhanced interactions among learners in learning groups.

This study was carried out on a MOOC titled "Success - Unleash Yourself" run by the University of Agder using the NovoEd platform (https://novoed.com/success-agder-2016). The course has been run twice in 2015 and 2016 each from January to March. Our study is aimed at understanding online learning group processes to identify effective online learning group mechanisms. Online Learning groups can help to bring distributed learners together to work. The goal was to establish processes of effective online learning groups in the MOOC. The research questions to be answered are how to form effective learning groups and how to sustain effective online learning group's processes. Further on, we answered the question of how to increase interaction of learners during online learning group process. Interaction is usually encouraged to increase learners' engagement when completing group assignments.

Collaborative learning refers to instructional methods that encourage learners to work together to find a common solution for a given task [4]. Collaborative learning involves effort by groups of learners who are mutually searching for meanings, understanding or solutions through negotiation [2, 5]. Collaborative learning occurs where there are interactions. Anderson in his online learning framework argues that for meaningful learning to happen, there must be high interaction in either student-teacher; student-student and student-content interactions [6]. Mayende, Muyinda [7] and Stahl, Koschmann [2] also asserts that learning takes place through student-student interactions. Ludvigsen and Mørch [8], found out that learners effectively develop deep learning when supported by computer supported collaborative learning. Therefore, a well-structured course to enhance group work can enable student-student interactions in computer supported distance learning [9]. Collaborative learning is based on consensus building through interaction by group members, in contrast to competition. Collaborative activities are essential to encourage information sharing, knowledge acquisition, and skill development [10].

The rest of this paper is organized in four sections. Section 2 presents the approaches and our research methods. In section 3, presents the findings of our work and discussions. Finally, the paper is concluded in section 4.

2 Approaches and methods

This section describes the course design for learning groups and the research methods used. This is described in the following subsections: modules, learning groups, learner support and methods.

2.1 Modules

The course was composed of four modules with specified tasks and activities, paced per course calendar. Learners were expected to complete all modules. The first module takes two weeks to establish the background and to connect the learners. This helps in establishing social connection among learners so that forming learning groups becomes easy. After that there are three modules that last for two weeks each and all of them follow the same basic structure (see table 1 below). The last week is used to wrap up the course and to sketch the way ahead.

Table 1. Basic timeline for a module

Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu
0		1			2	3	4		5	6			7		8		9

Table 1 shows the timelines for a module with the following activities.

- At point "0" the module content and the tasks for the first week are announced.
- At point "1" the first task is reading of the theory presented. This helped the learners to underpin their discussions in the open forums on the module theories.
- At point "2" submission of individual learners answer to the group activity as a starting point. This helped initiating learners into the group activity. Each learner comes into the group with their opinion about the group activity. This helps to increase participation in the learning group.
- At point "3" the reading is concluded with a quiz. This helped to assess the learners on the theories of the module. The quiz is developed in such a way that the learner can attempt the quiz three times. In each attempt the learner is given detailed feedback which enhances more learning about the theories.
- At point "4" tasks for the second week are announced.
- At point "5" the deadline for group hand-in is reached. This hand-in is based on the group's discussion and individual student answer to group task. It is during the group deliberations that the groups agree on final submission and the member who submits.
- At point "6" learners start working on individual hand-in with emphasis on group support. The team members are encouraged to consult their teams when working on the individual activity which is connected to the group activity but contextualized for everyone. Since learners have already worked on the group activity it is easy for the learners to consult one another when working on their individual submission.

- At point "7" soft deadline for individual hand-in.
- At point "8" hard deadline for individual hand-in; peer assessment of individual hand-ins begins.
- Finally, point "9" has the soft deadline for peer assessment of individual hand-ins (hard deadline on Friday that proceeds). The tasks for each week are displayed on top of the platform every time your login. This is an important affordance of the NovoEd tool.

2.2   Learning Groups

In the first module, there were auto-assigned learning groups of around 30 learners each. In the other modules, the learning groups were self-formed and each group had at most 5 members. The activities created for module one was aimed at connecting learners and getting familiar with the platform. This was good in building social connections in learning groups. A juggling activity was used in the first module. Learners were required to learn how to juggle and the submission required them to make video recording when they are juggling. This activity has a game concept which makes learners enjoy and get to know one another with ease. Since the juggling submission is seen by all learners, it helped in enforcing social connection. Activities were designed in such a way that each activity could build on another one within the module. For the activities to enhance group work, learners start with presenting individual answers to group activity. This is then followed by group discussion and hand-in. The learners are then given contextualized individual activity which is built on the previous group activity. Finally, there are at least three peer assessments on individual hand-ins. The final individual activity would be peer assessed using a pre-defined rubric which was developed by the course facilitators. In addition to the peer assessment, each assignment would get more feedback from learners through comments. All the submitted activities are accessed by all the learners in the course with possibility to comment and respond to comment. This encouraged interaction among learners online and learner support.

2.3   Learner Support and Peer Feedback

Learner support is important for online learning courses. Forums were created on the platform to help in giving or receiving feedback from the learners or facilitators. They were created to harness the experiences and knowledge from the community of participants. The learner support ranged from technical to subject matter. This was developed with the aim of allowing feedback to come from the learners themselves given the learner numbers in the MOOC. This fit well with the growing numbers of learners in higher education.

Peer feedback was encouraged since all the submissions were accessed by the learners in the MOOC. This allowed learners opportunity to give peer feedback through comments. Each submission received at least one feedback.

2.4 Differences in the MOOC

Most of the content of the course were the same. However, there was an emphasis on participation in the announcement for the MOOC of 2016. The announcement placed on the platform clearly stated that "this is not a usual MOOC, because it is designed for active learners. You must pay for taking it by putting in at least 10 hours of your time each week. The course features only a few videos, and the learning outcome is achieved by working on the tasks". This is perceived to have played a significant role in improving the course. In this course deadlines were changed from hard to soft. This seemed to have had a good impact on the learner's participation in the course. There was also flexibility on limits of the group size. In the 2015 MOOC, there was fixed limit of five (5) members per group. However, in 2016 MOOC limits of Group size were changed to seven (7) members. This usually happened when learners from the someplace or region wanted to be together in one group.

2.5 Methods

This paper is based on a comparative analysis of the course for 2015 and 2016. Qualitative and quantitative methods were used in collecting data and analysis. This helped in data triangulation. Two course surveys that is mid-term and course-end were run. The surveys contained both open ended and closed ended question. These surveys were responded to by learners on the two MOOC courses. Mid-term survey had 27 respondents for 2015 and 36 respondents for the 2016. Course-end survey had 61 respondents for 2015 and 66 respondents for 2016. Observation was also done on two online learning groups. The interactions on the forums were also used in the analysis. The qualitative data was analyzed by validating the quantitative data collected. This was the done through the themes created from the quantitative results presented.

3 Findings and Discussions

The course design helped learners to engage with course literature. At the end 1.44% of the learners received statements of accomplishment in the 2015 MOOC and 5.04% of the learners received statements of accomplishment in the 2016 MOOC. This is agreement with MOOC completion rates [11-13]. The findings are presented in the following subsections: course organization, do groups reduce structure, what helped with learning, are learning groups working, what did the group help with, and what collaboration tools were used.

3.1 Course Organization

This subsection describes the course organization. The organization determines the success and interactions of the learning group. This agrees with Mayende, Isabwe [9], who established that peer based assessment organization increased interaction and learning among group members. The course organization which puts emphasis on

learning group is shown in figure 1. Initially, the learners within the groups would submit individual work for the group activity. This helps to initiate the learners to the learning group activity and each learner to contribute to the learning group discussion. The points of disagreement from individual viewpoints increased the learners' meaningful learning. An individual submission is open to the entire class to give feedback which helps in the interaction and learning processes.
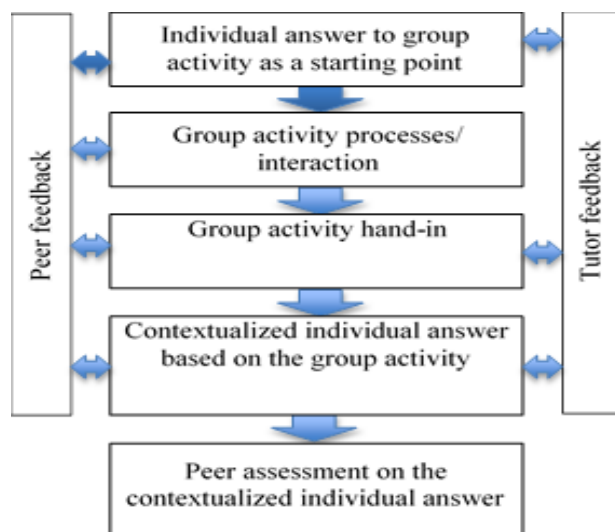

Fig. 1. Course organization

The individual answer to the group activity helps in the learning group discussions/processes. The learners discuss/find solution for group activity online either synchronously or asynchronously. Once the group answer has been arrived at it is submitted/handed-in. However, group hand-in is accessed by all the learners on the MOOC with affordances of peer feedback. The learners are encouraged to give feedback to other group submissions. After submission of the group work, the learners work on the contextualized individual answer which is based on the group activity. The learners are encouraged to consult with group members when working on this individual answer. Then the submission is peer assessed by at least three learners using the rubric developed by the facilitators of the MOOC. This course organization made group formations very easy and encouraged interaction among learners.

3.2   Do Groups reduce structure?

The learners were asked to reveal their perception about the course organization by asking the participants to indicate their levels of agreement to the statements regarding course organization. This was aimed to finding out if groups reduced the course structures. Figure 2 below indicates the percentage agreement with the statements for the MOOC of 2015 and 2016.
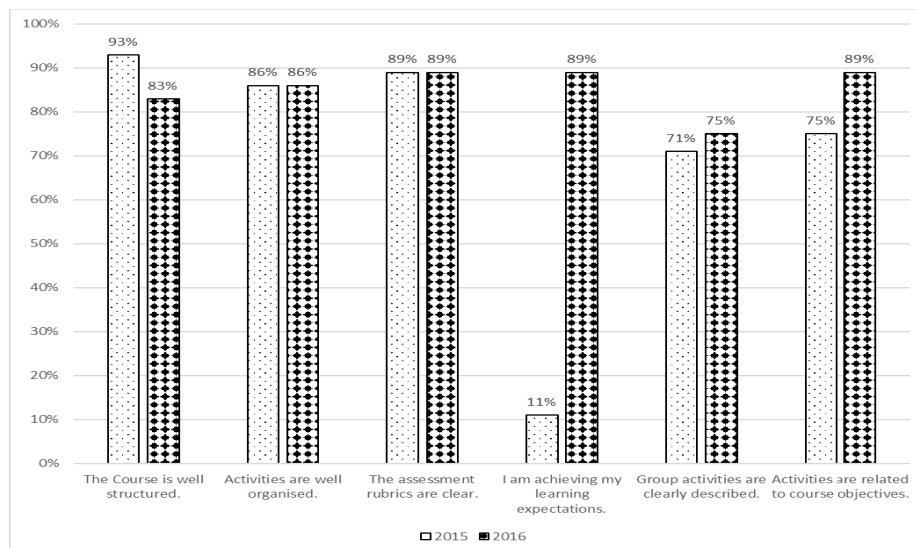
Fig. 2. Do groups reduce structure?

In both MOOCs, the learners perceived the courses to be well structured, activities to be well organized and assessment rubrics to be very clear. This is important in ensuring that online courses in higher education are successful. This is in agreement with our earlier study which indicated that a well-designed detailed course guide can lead to an effective online learning group [14]. The learners also perceived that they achieved their learning expectations in 2016. This could be reason for better completion rate for the course.

In both MOOCs learners agreed that group activities were clearly described with enough time allocation to the activities. This is important for online courses since these types of learners are doing many things in additional to studying. These are typical of distance learners who are working and studying at the same time, which is common for the learners of today. If the group activities are not clearly described this can lead to higher dropout rate especially for the online courses. This can also apply in higher education. It is important for online courses in higher education to ensure that the group activities are clearly described with enough time allocation to the activities. The learners also agreed that the activities were connected to the overall course objective. With activities, which are connected to the course objective, this will help to ensure that the learning outcomes are met.

Generally, learners in both MOOCs agreed that they did not need to be at campus to study this course efficiently. This agrees with already distance learning programmes which are offered at the same competence level. Participants also revealed the importance of forums; 46% believed that forum discussions were essential in the course in 2015 and 69% in 2016; 39% agreed that cafeteria forums helped in getting to know the members of the group in 2015 and 61% in 2016. This indicates that there was more interaction in the forums in 2016 than in 2015 which would be another cause for the better completion rate in 2016.

Therefore, use of learning groups in higher education can reduce online learning course structure. Knowing that online learning groups reduced structure, the next section explores what helped with learning.

3.3 What helped with learning?

Learners revealed that the following teaching resource contributed to learning outcome as shown in figure 3.
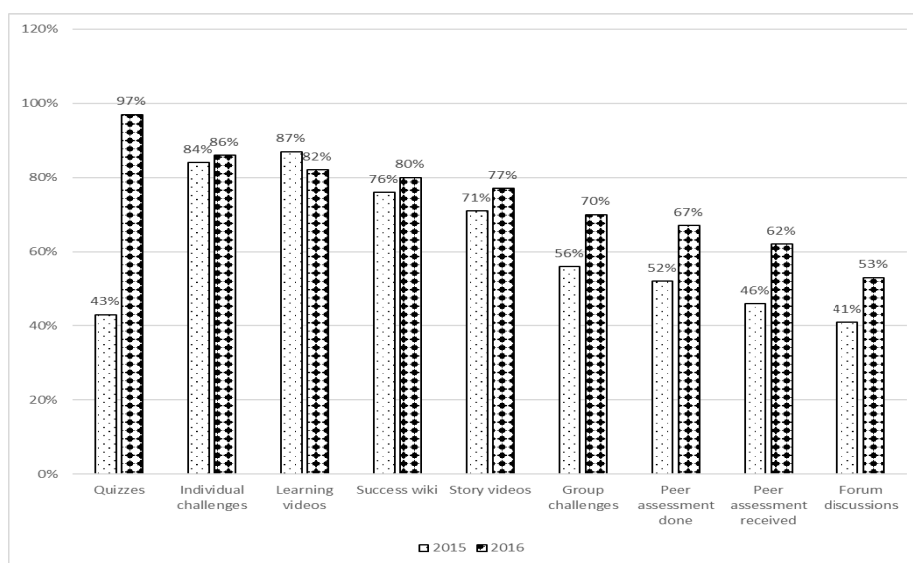

Fig. 3. What helped with learning?

The respondent's perceived quizzes to support learning in the 2016 MOOC. The quizzes were designed with aim of helping learners understand the theories of the course. The quizzes were compulsory and highly dependent on theories of the course. This indicates that the 2016 MOOC benefited more as compared to the 2015 MOOC. This shows that the participants in the 2015 MOOC didn't give enough time to the course literature which was a foundation for the course. Hence the difference in completion differences. The findings also revealed the importance of individual challenges, learning videos, success wiki and story video. Story videos were important because they connected well to the theory by giving authentic examples which helped learners to learn with easy.

The findings reveal differences in group challenges, peer assessment done and peer assessment received with advantage skewed towards the MOOC of 2016. There is need to boost group assignment's contribution so that more completion rates can be achieved. This can be done by the facilitators increasing on the feedback they give to the learners. This is not possible in the MOOC since usually the numbers are very

high. However, this can be done in high education courses by increasing the online tutors to help in providing learner support and feedback.

Peer feedback played a significant role in ensuring interactions with the course platform. Since all the submissions were assessed through the platform the learners interacted and helped peers get more feedback on their submissions.

Peer assessment was done on final contextualized individual answer. The facilitators developed rubrics that assisted the learners to asses' other learner's submissions. It was emphasized that each learner should give assessment to at least three other learners. The peer assessment was viewed by the learners to help them know how they have been assessed which will help better understanding of the concepts missed out. Learning happens both during provision of peer assessment and receiving peer assessment.

The learners also felt that the course resources helped them in doing the group activity with 68% for 2015 MOOC and 83% for 2016 MOOC. Having course resources that are connected to group activity can help in ensuring effectiveness of the online learning group. Though having indicative course resources to do group activity is important, learners should be allowed to be innovative and bring in new course resources when doing their assignments. This is possible with an online learning community. The learners of the MOOC of 2016 (72%) agreed to the roles and processes for problem solving more than the MOOC of 2015 (43%). This shows that there are better group dynamics in 2016 as compared to 2015 which can be one of the reason for the better completion rate. For purposes of effective social group connection, it is important for the group members to agree on the roles and processes within the group. However, groups build cohesion over time of interactions. This time element should be incorporated in the course structure. This is a very important aspect that can be adopted in higher education to have effective online learning groups. Results also revealed that only a few participants in both MOOCs were frustrated with one or more group members and the group size was big and distracted the group. The group size of five (5) members can bring about effective interaction and group deliberations. Since group size was five that is the reason they felt that they were not distracted by the group size and frustrated with one or more group members. This group size is easy to monitor and the members feel a sense of belonging.

Learners were also asked about the effectiveness of the online learning groups. Forty four percent (44%) felt that it was 70% and above effective, 40% felt that it was 40% - 60% effective, 16% felt it was below 40% effective. This reveals an indication to the right direction with 84% feeling that the effectiveness of the learning groups was above 40%. The organization of the course played a significant role in the effectiveness of the online learning groups. However, this should also be coupled with appropriate online learning groups and activities. This then brought us to question if learning groups were working as elaborated in the next section.

3.4 Are learning groups working?

Learners were asked their perception of online learning groups. Figure 4 shows the percentage of respondents who perceived the statements to be true about their online learning groups in both MOOCs.
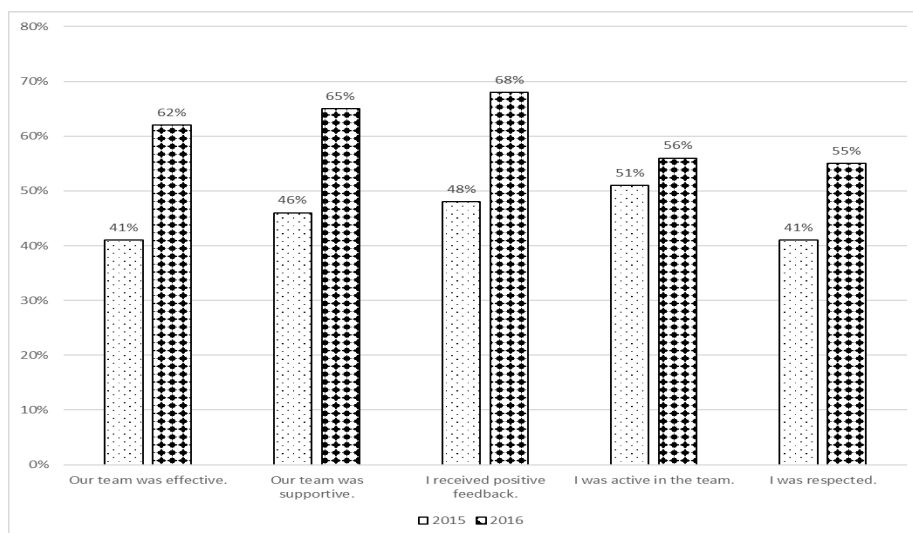

Fig. 4. Are learning groups working

On average 55% of respondents agreed with positive statement about learning groups in 2016 and 40% in 2015. The statements included the following "Our team members were supportive and encouraging each other", "I received positive feedback from my peers". "Our team members respected my opinions". The above statements indicated high percentage of agreement. These helps in motivating and sustaining interaction within learning groups. However, learners never reached levels of sharing jokes during their group discussion which is indication that the groups had not got to high levels of group dynamics as indicated in the Tuckman five stage model [15]. Learners shared jokes in the 2016 MOOC (21%) compared to the 2015 MOOC (13%). These elements are very important aspects of effective online learning groups in helping to motivate members. In higher education, it should be encouraged to let learners know that support, encouragement, positive feedback, respecting opinions from group members are important aspects for effective online learning groups.

Motivation is important for sustainable online learning groups. Motivation is not one-off event but a continuous process throughout the learning group life. Learners agreed that they were motivated by their peer's interaction within the group. One of the learners said, "The more you get quick feedback on your submissions definitely the more you get motivated". Eighty six percent (86%) agreed with the above statements in 2016 and 50% in 2015. For effective online learning groups in higher education group members should be motivated within the group by their peers and facilita-

tors. Gallimore and Tharp [16], suggested that positive feedback encourages learner participation.

Student interactions are important in increasing learning [6]. Interactions are encouraged through course organization. The organization allowed open feedback on all submissions by all the learners. The learners received feedback through comments on their submissions. Though the cafeteria forum was meant for social discussions, it generated a lot of content-related interactions. Learners interacted with classmates using questioning which generated a lot of discussions. Questioning that provoke other learners to think more or read content can help in assisting learning [16]. Some of the examples picked from the forums that used questioning: - "I agree with your thoughts on being successful in learning regardless of the type - good or bad - of experience. Do you think that almost everyone wants to be successful in learning?" and "Not achieving/finishing a task is not always failure; sometimes it is success delayed. What do you think?" This encouraged many learners to interact with classmates through these forums. This therefore is indication that learning groups are working and in the next section we elaborate what did the group help with.

3.5 What did the group help with?

The learners were also asked about how group members helped each other. Figure 5 shows the details of the findings.
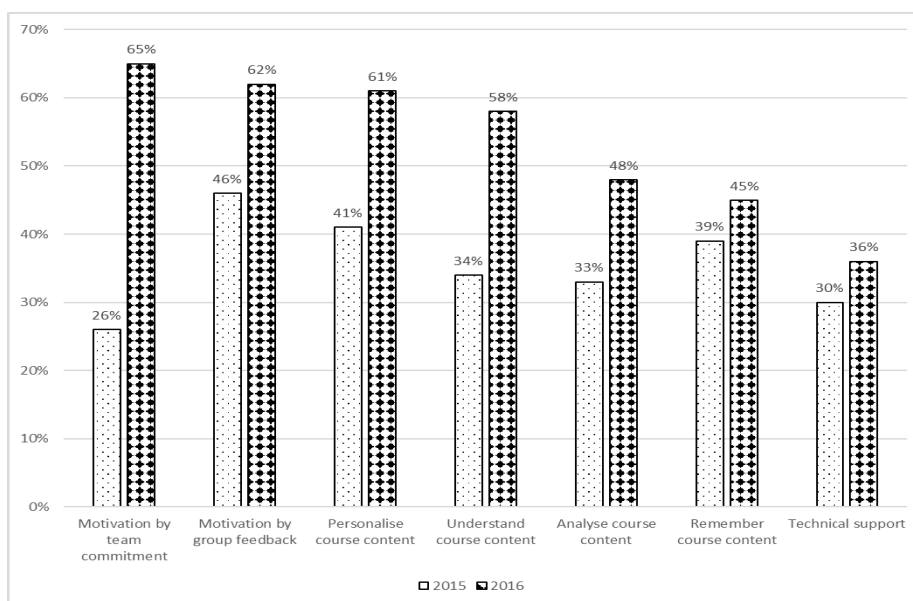

Fig. 5. What did the group help with?

As indicated in figure 5 learners felt motivated by team commitments and group feedback. This agrees with educational psychologists who believe that positive re-

wards play a significant role in encouraging participation and interaction [16]. Learners were given guidelines on how to respond within the groups e.g. encouragement to give positive feedback. Guidelines on how learners should behave are very important to the motivation of learners in online learning groups. This is equally important for higher education. Therefore, encouraging learners to give positive feedback will help in motivating the learning group members. When interactions or commitment within the group are high, the other learners will fear to let down their team members. Motivation is vital in sustaining interactions and learning in learning groups.

Learners were asked their perception of their interactions in learning groups. The percentage of respondents who perceived the statement to be true about their interactions in the learning groups. The statements were required to understand the level of interactions in the groups based on Bloom's taxonomy. The interaction questions were based on the verbs remember, understand and analyze. Remember is based on recalling facts and basic concepts, understand is based on explaining ideas or concepts and analyze is based on drawing connections among ideas. On average 52% of the respondents in 2016 MOOC perceived their interaction to lower levels of remembering and understanding while 37% of respondents in 2015 MOOC. This can be improved by facilitators getting involved in the interaction to provoke for higher level cognitive interactions. However, it is not easy for MOOCs given that the numbers of learners are usually very high. This can be done in higher education by the facilitators provoking learners during their interactions in the groups. Respondents also revealed that they used individual experiences when discussing the course concepts. This helps learners get new knowledge from authentic examples from more knowledgeable peers. The interaction was due to the design of the course which allowed peer feedback and assessment.

There were also forums created with the aim of supporting learners on both technical problems and content. These forums equally received a lot of posts and comments which helped the learners in getting support from other learners and tutors. Because forum interactions are open to all learners and tutors, the interactions were quality assured since corrections are made in case some person gives wrong comment. Learners felt that they can improve their ability to express thoughts online. In 2016, 89% responded in agreement that they could improve their ability to express themselves while there was 50% for 2015 MOOC. This shows that the learners started finding interaction interesting and easy which could be an indication difference in completion rate. Equally the experiences that the learners came with in the course helped others to learn from them. This helps the knowledgeable peers to scaffolding other learners given their firsthand experiences from their work or previous work. The next section explains the tools used by the online learning groups.

3.6 Which tools were used?

This course was run on NovoEd platform but with flexibility to allow learners use other collaborative tools. Though there are so many technologies that can be used for collaboration student revealed that they used the following tools as shown in figure 6.
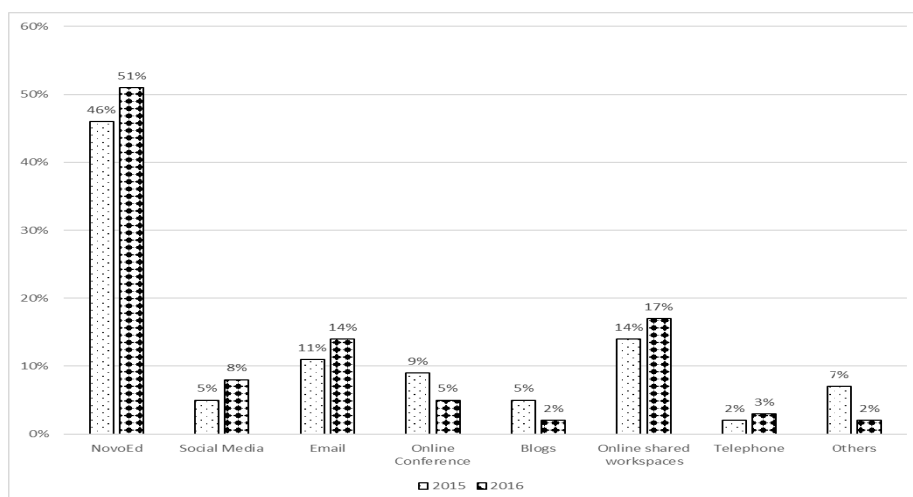
Fig. 6. Which tools were used?

NovoEd was the most used tool, because this was the platform that the course was run. Mostly, the NovoEd tool was used in the collaboration of the learning groups. However, other collaboration tools were also occasionally used.

Eighty two percent (82%) of the respondents felt that they sometimes got lost in the platform and failed to find what they wanted in the 2015 MOOC while 31% for 2016 MOOC. This shows that learners in the second MOOC were more comfortable using the platform than the first MOOC. This has a significant bearing on the effectiveness of a learning group. Likewise, 89% of the respondents in 2015 MOOC also felt that it was difficult for them to learn how to use NovoEd unlike 11% for 2016 MOOC. This might have been because many of the learners who attended 2016 also come back from the 2015 MOOC. This makes them have fewer challenges using the platform. Fewer respondents 14% felt that they were comfortable seeking help via the forum while the 2016 MOOC had 75% who would get help from the forum.

Table 2. Effective collaboration tools

Statement	2015	2016
Our team has used collaborative tools outside NovoEd.	13%	30%
In team interaction, it was sometimes frustrating to use technology.	30%	20%
NovoEd was an effective tool for team work.	46%	62%
Google hangout was an effective tool for team work.	20%	21%

The table 2 shows how learners felt about the effectiveness of the collaboration tools used. It was indicated that tool support in the 2015 MOOC was 29% and 2016 MOOC represented 36%. Participates also revealed about provision of technical support during group work with 13% for the 2015 MOOC and 30% for the 2016 MOOC. Tool usability is important for the success of online learning group.

4   Conclusion

We conclude that the course organization structured for online learning groups has the potential to increase individual participation in groups. As such the course organization, can be an effective mechanism for facilitating online learning group activities in higher education. The course organization removes the known burden of supporting large student numbers reminiscent of MOOCs as it increases interaction among participants. The course organization help in providing clear sets of activities well aligned to the learning goals and resources. The increased feedback mechanism within the course organization is good pre-cursor to participation motivation which leads to low levels of dropout. Therefore, for an effective online learning group the following must be emphasized; well-structured course organization that supports group work, well-structured group activities that have the affordances of online collaboration and connected to the goals of the course, guiding learners on how to motivate others through feedback and questioning, encouraging interaction within a learning group, learning group tool usability and features that have the affordance of group processes and online technical support.

5   Acknowledgment

6   References

[1] Muyinda, P.B., G. Mayende, and J. Kizito, Requirements for a Seamless Collaborative and Cooperative MLearning System, in Seamless Learning in the Age of Mobile Connectivity. 2015, Springer. p. 201-222. https://doi.org/10.1007/978-981-287-113-8_11

[2] Stahl, G., T. Koschmann, and D. Suthers, Computer-supported collaborative learning: An historical perspective. Cambridge handbook of the learning sciences, 2006. p. 409-426.

[3] Aguti, J.N., D. Nakibuuka, and R. Kajumbula, Determinants of Student Dropout from Two External Degree Programmes of Makerere University, Kampala, Uganda. Malaysian Journal of Distance Education, 2009. **11**(2): p. 13-33.

[4] Ayala, G. and S. Castillo. Towards computational models for mobile learning objects. in Wireless, Mobile, and Ubiquitous Technology in Education, 2008. WMUTE 2008. Fifth IEEE International Conference on. 2008. IEEE.

[5] Ashley, P., A Teaching with Technology White Paper. Collaborative Tools. Retrieved on November 1, 2014 from http://www.cmu.edu/teaching/technology/whitepapers/CollaborationTools_Jan09.pdf, 2009.

[6] Anderson, T., Modes of interaction in distance education: Recent developments and research questions. Handbook of distance education, 2003: p. 129-144.

[7] Mayende, G., et al., Facebook Mediated Interaction And Learning In Distance Learning At Makerere University in 8th International Conference on e-Learning, 15 – 18 July. 2014: Lisbon, Portugal.

[8] Ludvigsen, S. and A. Mørch, Computer-supported collaborative learning: Basic concepts, multiple perspectives, and emerging trends. The international encyclopedia of education, 2010. **5**: p. 290-296. https://doi.org/10.1016/B978-0-08-044894-7.00493-0

[9] Mayende, G., et al. Peer assessment based assignment to enhance interactions in online learning groups. in Interactive Collaborative Learning (ICL), 2015 International Conference on. 2015. IEEE.

[10] Collison, G., et al., Facilitating online learning: Effective strategies for moderators. 2000: ERIC.

[11] Salmon, G., et al., Experiential online development for educators: The example of the Carpe Diem MOOC. British Journal of Educational Technology, 2015. **46**(3): p. 542-556. https://doi.org/10.1111/bjet.12256

[12] Salmon, G., et al., Designing Massive Open Online Courses to take account of participant motivations and expectations. British Journal of Educational Technology, 2016. https://doi.org/10.1111/bjet.12497

[13] Jordan, K., Initial trends in enrolment and completion of massive open online courses. The International Review of Research in Open and Distributed Learning, 2014. **15**(1). https://doi.org/10.19173/irrodl.v15i1.1651

[14] Mayende, G., et al. Supporting Learning Groups in Online Learning Environments. in 7th International Conference on Computer Supported Education. 2015. Lisbon, Portugal. https://doi.org/10.5220/0005433903900396

[15] Tuckman, B.W. and M.A.C. Jensen, Stages of small-group development revisited. Group & Organization Studies, 1977. **2**(4): p. 419-427. https://doi.org/10.1177/105960117700200404

[16] Gallimore, R. and R. Tharp, Teaching mind in society: Teaching, schooling and literate discourse in Moll (ed) Vygotsky and education: Instructional implications and applications of socio historical psychology Cambridge university press. 2002.

7 Authors

Godfrey Mayende is a PhD student in the Department of Information and Communication Technology, Faculty of Engineering and Science, University of Agder, Norway and an Assistant Lecturer in the Institute of Open, Distance and eLearning, Makerere University, Uganda. Research interest: Learning Groups, Online Learning, Online Learning Systems, eLearning, Distance Learning.

Andreas Prinz is a Professor at University of Agder in Norway and works with systems engineering for telecommunication, eHealth, and embedded systems. He focuses on modelling, languages and formal methods. He is currently very interested in the use of modern ICT tools for teaching.

Ghislain Maurice Norbert Isabwe is an Associate Professor in Multimedia and eLearning in the Department of Information and Communication Technology, Faculty of Engineering and Science, University of Agder, Norway. His areas of interest include human-centered design of interactive systems; open, distance and e-learning; visualizations and simulations in mathematics education; gamification of learning and mobile learning.

Paul Birevu Muyinda is an Associate Professor and Dean of School of Distance and Lifelong Learning at Makerere University, Uganda. He is an experienced ODeL teacher, researcher and professional. He has research interest in ICT impact evalua-

tion, virtual education, e-learning, distance education; m-learning, online learning, blended learning, open education resources (OER); ICT4E, ICT4D and Massive Open Online Courses (MOOCs). College of Education and External Studies, Makerere University, Uganda.