

# Improving Communication in Online Learning Systems

Godfrey Mayende<sup>1,2</sup>, Andreas Prinz<sup>1</sup> and Ghislain Maurice N. Isabwe<sup>1</sup>

<sup>1</sup>*Department of Information and Communication Technology, University of Agder, Grimstad, Norway*

<sup>2</sup>*Institute of Open, Distance and eLearning, Makerere University, Kampala, Uganda*

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**Abstract:** In this paper, we study communication in online learning systems using both quantitative and qualitative research methods. Quantitative methods provide the interaction statistics, while qualitative content analysis was used for categorisation of the messages. It turns out that 20% of the active participants dominate the online learning interactions, and more than 80% are passive consumers. From the categorization, we learned that most of the communication is not related to learning, but to technical problems (26%), small talk (29%), sharing experience (16%), and encouragement (11%). Only 10% are related to the content. For improved communication, it is therefore important to use the right communication tools in the online learning systems. Especially, learning by content creation should be provided.

## 1 INTRODUCTION

Distance learning is a mode of study where students have minimal face-to-face contact with their facilitators; the learners learn on their own, away from the institutions, most of the time (Aguti and Fraser, 2006). Nevertheless, (Vygotsky, 1978) argues that a person's learning may be enhanced through engagement with others. Use of computer supported collaborative learning can offer possibilities of students' interactions (Muyinda et al., 2015). In particular, technology can help virtually form learning such that learners can learn collaboratively (Mayende et al., 2015a). However, motivating and sustaining effective student interactions requires planning, coordination and implementation of curriculum, pedagogy and technology (Stahl et al., 2006).

Online learning systems often include a way to support learner interaction, either by integrating with Facebook or using an own system for that purpose. We look into three large online courses with communication support, namely Uncompromised Life, Soulvana and Duality. All of them are paid courses in the area of personal development, such that we can assume high dedication from the side of the learners. The communication possibilities in all three courses were similar, even though one of the courses uses Facebook, while the other two use a separate platform.

Engagement in online learning systems is achieved through active participation on these communication platforms. It is our intention to find out how to make learners more engaged in online courses. We hope this will in turn bring about meaningful learning. This is based on the view that active participation in a course by communicating is associated with better learning output.

The paper continues in section 2 with reviewing the collaborative learning. Section 3 describes the courses we have studied, while section 4 presents the approaches and research methods. The finding are presented in section 5 and good practice for online course design in section 6. Finally, the paper is concluded in section 7.

## 2 COLLABORATIVE LEARNING

Collaborative learning refers to instructional methods that encourage students to work together to find a common solution (Ayala and Castillo, 2008). collaborative learning involves joint intellectual effort by groups of students who are mutually searching for meanings, understanding or solutions through negotiation (Ashley, 2009; Stahl et al., 2006). This approach is learner-centred rather than teacher-centred; views knowledge as a social construct, facilitated by peer interaction, evaluation and cooperation; and learning as not only active but

interactive (Vygotsky, 1978). This interaction is in line with Anderson's online learning framework which argues that learning can be achieved through student-teacher, student-student, and student-content interactions (Anderson, 2003). This is also apt with (Stahl et al., 2006) who asserts that learning takes place through student-student interactions. Students effectively develop deep learning when using computer supported collaborative learning (Ludvigsen and Mørch, 2009). Therefore, careful integration of computer supported interaction can heavily increase learning in online learning systems.

Collaborative learning is based on consensus building through interaction by group members, in contrast to competition. This can be very helpful for distance learners, who are typically adults. Collaborative activities are essential to encourage information sharing, knowledge acquisition, and skill development (Collison et al., 2000). Different technology tools have been adopted for collaboration in distance learning.

Collaborative learning hinges on the belief that knowledge is socially constructed although each learner has control over his/her own learning. Online learning systems offer possibility for these collaborations to be achieved through communication among learners. Collaborative learning is underpinned by the social constructivist learning theory (Vygotsky, 1978). This is used in the online courses studied and described in the section below.

### 3 THREE ONLINE COURSES

We study three online courses, which are offered by Mindvalley in the personal development area. They are paid and use the Mindvalley platform for the course material. For one course, the discussion is run in a closed Facebook group, while for the other two the Mindvalley discussion platform is used. For the sake of this article, the discussion functionality in Mindvalley is designed like Facebook.

*Mindvalley* is an online teaching company in the personal development area. It focuses on life skills that regular schooling does not cover, based on the world's top personal growth authors and brands. The Mindvalley teaching platform features a discussion area structured like Facebook.

*Facebook* is a social media online platform built with no perceived affordance for teaching and learning. Nevertheless, many studies have used it for teaching and learning and it is promising for

increasing interaction in groups (Li et al., 2016; Mayende et al., 2014; Munguatosha et al., 2011).

#### 3.1 Uncompromised Life

This course teaches everyday psychology to sort out the day and night things that matter in life. The course runs for eight weeks and learners are taught eight transformations. The following elements are discussed: focus and clarity of mind, mental models, law of attraction, handling change, productivity, daily habits, self-love, and self-confidence. This course is purely run online using the Mindvalley online learning system and the Mindvalley discussion platform.

#### 3.2 Duality

This Mindvalley course is related to the duality between energy and reality. It runs for eight weeks and teaches the following seven improvements: getting fast answers, manifesting the life you want, feeling happy now, stopping the fight against yourself, accelerated healing, perfect relationships, and living your ultimate life. This course is purely run online using the Mindvalley online learning system with discussions in a closed Facebook group.

#### 3.3 Soulvana

Soulvana is not a course, but a subscription. It does not have duration, but presents a new teaching every week. Often, the teaching is related to other courses in Mindvalley, or given by authors that are connected to Mindvalley. Due to the format, the area is broader than the other two courses. The connection between the topics in Soulvana is the focus on spirituality and its use to improve everyday life. Just like the other two this course is run on the Mindvalley platform including discussions.

## 4 APPROACHES AND METHODS

### 4.1 Communication in a Course

This paper uses three categories of course communication: discussion, message and creation.

*Discussion* is a transient exchange of information. The Cambridge dictionary defines discussion as the activity in which people talk about something and tell each other their ideas or opinions (Dictionary, 2008). This communication can be both verbal or non-verbal, synchronous or asynchronous.

Discussions are often supported within online learning systems using text based asynchronous discussion threads.

*Message* is a one-way information exchange. The Cambridge dictionary defines a message as a short piece of information that you give to a person when you cannot speak to them directly (Dictionary, 2008). This communication can be both verbal or non-verbal. Messages are important when communicating to the students about something in the online learning systems. A typical way to send messages is email communication, or course messages.

*Creation* is communication with the purpose of creating something. An example is the creation of a poem by a group of students. Here, the communication does not directly lead to the end results, but rather supports it. This part can be available in online learning systems as co-creation of artifacts, group projects, pair programming, debate and wiki. In our three selected courses, creation was not available.

## 4.2 Methods

The communications in the three online courses were analysed from the autumn 2015 until January 2016. Uncompromised Life and Soulvana messages were extracted from the Mindvalley platform, while Duality course messages were extracted from Facebook. Quantitative methods were used on the three data sets to get the general statistics related to communication and participation within these three courses.

For a deeper understanding, content analysis was done by manually categorizing the type of messages being communicated. Then the different categories were analysed statistically to understand what was happening in the online interactions. The chosen categories are based on an a-priori opinion of the kind of messages in the set. This way, some messages could fit more than one category. In these cases, the best fit was chosen.

## 5 FINDINGS

This section describes the findings of the study. It is divided into three parts; the general participation of the online courses, interaction in the online courses and communication needs for online learning systems.

### 5.1 General Participation

This part describes the general statistics of the findings from the three online courses, divided into enrolments in the online courses, participation in the discussions and discussion threads in the online courses.

#### 5.1.1 Enrolment in the Online Courses

The three online courses had large class sizes. Each of the courses had at least 3,000 participants enrolled, with Uncompromised Life, Soulvana and Duality having 3,385, 3,464 and 3,000 participants, respectively. The number for Duality is an educated guess, as there was no accurate number of participants in Duality available. These numbers are comparable to enrolment of MOOCs (Meinel et al., 2014; Salmon et al., 2015; Salmon et al., 2016). Far less participated with sending at least one message on the platforms, namely 625 (18%) for Uncompromised Life, 638 (18%) for Soulvana and 350 (12%) for Duality. We see that most of the participants were passive consumers of content. The lower participation for Duality is probably due to the manual enrolment into the Facebook group, while the other two courses had automatic enrolment into the Mindvalley discussion platform.

#### 5.1.2 Participation in the Discussions

This shows the active participation on online course. In this study active participation is communicating by sending atleast one message. The percentage of active participation in the courses were 18%, 18% and 12% for Uncompromised life, Soulvana and Duality respectively. The active participants were also active in starting own discussion threads, and not only answering to the existing threads. Own discussion threads were started by 57%, 43% and 65% of the active participants in Uncompromised Life, Soulvana and Duality, respectively.

The Pareto principle which maintains that 80% of output from a given situation or system is determined by 20% of input, applies for the messages. This is so because twenty percent (20%) of the active participants contributed almost 80% of the total messages. Another interesting statistics is the ratio of messages by the teaching team. On the Mindvalley platform, the teachers contributed 18% of the messages, in contrast to only 3% in the Facebook group. Finally, there was always one very active person, contributing around 10% of all the messages alone.

### 5.1.3 Analysis of Discussion Threads

Figure 1 shows the analysis of discussion threads. We remember that threads were started by around 50% of the active participants. We found that the threads are mostly discussions. They have on average a relatively small number of messages in them (5, 4, and 8), and their life span is short (2.5, 1.2, and 1.3 days).

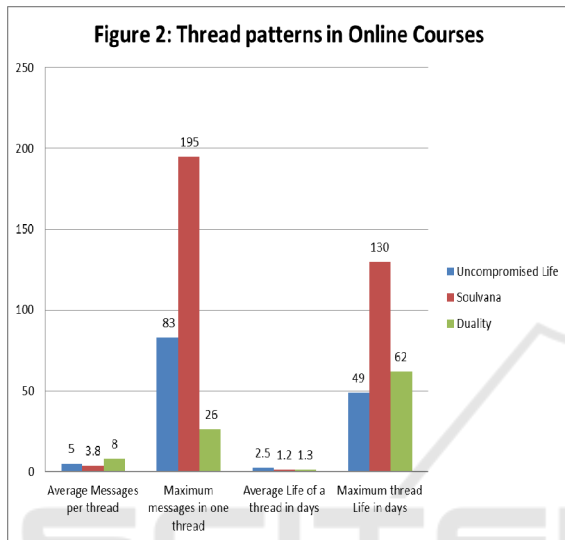


Figure 1: Thread patterns in Online Courses.

This indicates that the platforms are not suited for long-time interactions. In both platforms, threads pop up higher in the ranking when they are active. This way it is possible that few threads have a long life (maximum 130 days with 195 messages in Soulvana). For comparison, Uncompromised Life has maximum 49 days with 83 messages, while Duality has maximum 62 days with 26 messages.

That analysis indicates that there was minimal learning taking place in the discussions, which is examined more closely in the next part.

## 5.2 Interactions in the Online Courses

Interaction is very important in online learning systems. Therefore, we want to understand the kind of interactions going on in the online learning systems. As explained in Section 4.2, we analysed the content of the messages. Categories were defined a priori and the messages were sorted into the categories. Table 1 shows the result of the sorting.

A major part of the communication is geared around technical problems (26%). These were questions aimed at asking for help on how to use the online learning system. It turned out that the discussion

Table 1: Interaction messages being communicated.

Major Category	Sub category	%	%
Technical problems	Technical questions	14%	26%
	Answers to technical questions	12%	
Smalltalk	Introduction of people	4%	29%
	Welcomes	5%	
	Thanks	18%	
	General Smalltalk	2%	
Content	Content questions	4%	10%
	Answers to content questions	6%	
Sharing experience	Sharing experience	11%	16%
	Agreement with experiences	5%	
Encouragement	Encouragement	11%	11%
Others	Connection between people	2%	8%
	Create something jointly	0%	
	Empty & unrelated	6%	

platform was not a good place to handle such problems, as the same questions and answers used to turn up in regular intervals. It was impossible to find out if the same question was asked before and it was even difficult to find the correct answer if it was in the same thread. Most of these interactions were more of a message kind, and a discussion kind.

The second major category was smalltalk messages contributing with 29%. Smalltalk is very important in group dynamics since groups of these students have to go through the different phases of the group for it to be effective, from Tuckman five stage model (Tuckman and Jensen, 1977).

Ten percent (10%) of the messages were related to content: asking questions and getting responses to the questions. The content interactions are closest to the idea of learning by communication, as they directly involve the material taught.

The second major learning related interaction is the sharing experiences with 16% of the messages. Sharing is important in personal growth courses, as learning is exactly about own experiences. Still, learning in this case happens outside the system, and only the result are reflected in the platform.

In a similar way, encouragement helps with motivation for the learning, but is not related to the learning itself. Encouragement contributed 11% of the messages.

The remaining messages are largely not categorized, including empty and unrelated posts. However, there are two categories that deserve mention: there are 2% of messages related to connection between people, mostly based on same language and/or same location. This indicates that people are interested in communication in their own language and face to face. Finally, there are 13 messages where some participants attempted to create something jointly, which is marginally related to the total number of messages.

Considering only the teachers, the situation is as follows: 15% content answers, 35% technical answers, 16% encouragement, 10% thanks, and 16% welcome plus few uncategorized posts.

The kind of interactions changed over time, this is shown in the differences in focus from December to January.

- technical questions 31% -> 22%
- smalltalk 21% -> 3%
- thanks 15% -> 21%
- content 5% -> 14%
- sharing 22% -> 31%
- rest 6% -> 9%

This indicates that the participants get more focused and experienced with the platform which brings a shift from smalltalk and technical questions to content and sharing experience.

A general observation is that the interactions are full of recurring questions, both related to content and technical questions, sometimes even in the same thread. This indicates that the systems are designed for discussions, where it is not planned to go back to previous arguments. In a discussion, the interactions are only the background, and they do not have a life on their own. This is in contrast to messages, which are important on their own and need to be searchable and easily accessible. This is even more important with large numbers of participants.

### 5.3 Communication Needs

Based on the findings in the previous section and knowing that engagement can be achieved through communication, the following communication needs are derived from the analysis. The three different forms of communication (discussion, message and creating) are used as a basis for the needs.

*Announcements* communicate course status and progress. They can trigger learner engagement and improve the feeling of teacher presence within the online learning systems. This is basically a message communication. The best way to implement announcements is by using a message board, which

can be embedded in the users home page. The systems analyzed in this paper do not properly support this component, and use discussions instead.

*Course administration information* is related to the course structure and in this way an equally vital one-way communication message. The best way of implementing them starts already outside the online system with a clear structure and description of the course. Then it can be shown with clean pages followed by good help pages. The systems analyzed here again used discussions for this component, which is not appropriate.

*Course material* refers to the content of the course, including text, videos, and audios. This is message communication, and as the course administration information, a clear structure that is visible in the course is the best way to implement it. This component is very important because it feeds into other communication types of discussion and creation. The main point here is to have a good description of the activities that connects well to the course materials, which can motivate learners to engage with course materials. This is further discussed in the next section.

*Sharing, support, and encouragement* can be done in both small and big groups because they help in motivating learners in the online learning systems. This is a discussion, where the result is created during the interaction, and the thread itself is auxiliary. It is important to establish a code of conduct for the discussion groups, including privacy (non-disclosure). Dunbar's number suggests that 150 is the cognitive limit to the number of people with whom one can maintain stable social relationships (Dunbar, 2010). These are relationships in which an individual knows who each person is and how each person relates to every other person. Above that number, groups will give a feeling of anonymity, which could help to share some more embarrassing information (Gonçalves et al., 2011). For group discussions in your course, a group size of five would be more effective (Mayende et al., 2015a).

*Discussion and clarification* are used when dealing with course content. These are discussion interactions and they do not produce results, but are just auxiliary. If well planned and organised they lead to changes in the content and learning. Usually, if they are triggered by activities around the content they can enhance engagement and learning.

## 6 GOOD PRACTICES FOR ONLINE COURSE DESIGN

### 6.1 Communication in Online Learning Systems

Based on the findings we suggest ways to improve communication in online learning systems. There are several areas where learning happens in online or traditional settings, which are not currently used in the studied courses. These kinds of communication are related to more active modes of learning, like discussion groups, practice by doing and teaching others/immediate use as shown in the figure 2.

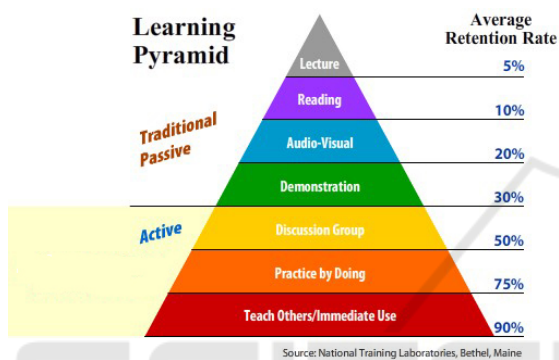


Figure 2: Learning Pyramid.

It is important to be clear that the modes of communication used here are most often not discussions. We collect the recommendations below:

*Individual content* allows users to store content related to their learning, probably somewhere in the user area related to the course. It is not limited to individually complete questionnaires, quizzes, and reflections. These are in the category of (one-way) message, but here they belong to the user.

*Joint content* is content that is created by groups of learners, maybe all learners in a course. It helps to create content jointly; good examples are wiki pages and google docs. These fall into the category of creation, and do not exist in the studied online learning systems. A discussion might be associated to the joint content.

*Learning groups* are important for dedicated and meaningful learning. These groups are connected to a joint task, for example discussing a statement or creating something. In terms of communication, this is a combination of discussion and joint or individual content. The discussion is used in order to create, but disappears later. It is also possible that nothing is created apart from learning.

*Mentoring (coaching) for groups* provides input to the individual or the group process. This is very important for learning groups as the groups tend to get stuck once in a while. By mediating learning, the mentors can provoke learners to discuss issues that they would not have discussed otherwise. The mentoring often does not result in an artifact, but it may contribute to an improved artifact.

*Peer-to-peer evaluation and assessment.* In a learning setting, peer-to-peer evaluation is a feedback message mechanism supporting learning. It can be embedded into the learning process at several places, not only at the end. Peer assessment can be based on groups or on individuals. When well embedded within the course structure improved learning can be achieved (Mayende et al., 2015b; Mayende et al., 2017).

### 6.2 Synchronous Communication and Physical Contact

Communication in online learning often lends itself to an asynchronous mode, because learners may have different time zones and different times to access the learning environment. There is a general trend to rely more on virtual connection than physical ones (Turkle, 2012). However, from a learning perspective, this is not the best option. For improved learning, also synchronous communication should be considered.

Mehrabian found that 7% of any message is conveyed through words, 38% through certain vocal elements, and 55% through nonverbal elements (facial expressions, gestures, posture, etc) (Mehrabian, 1971). Typical discussion forums like in Mindvalley and Facebook use only the 7% part, and therefore miss out much on the other components.

At the University of Agder online courses, we arrange a physical meeting with the course participants which is then used as a basis for the asynchronous and online communication. This improves engagement a lot. Equally at Makerere University we arrange physical meetings of two weeks twice a semester which improves engagement when studying the courses.

Experiences with lecture streaming and capture at University of Agder indicate that the (perceived) live event of a lecture is much more valuable than the playback. In particular, this leads to the fact that students follow what is said more closely. It seems that the important aspect is the synchronous communication, and in particular the life presence of the students (not necessarily the teacher). Based on

this experience, it is not a good idea to run video lectures as non-timed playback, but rather organize several time slots where the students meet at the same time.

Life communication in a large group of participants (more than 10) will typically be restricted to statistical interaction (raise your hands) and can be implemented using Kahoot (<https://getkahoot.com/>). However, group processes in learning (learning by discussing) are typically connected to synchronous meetings. These have to be in smaller groups (around 5).

Of course, after knowing that synchronous communication is good, and physical meetings are even better for learning, the question is how to facilitate that for an online learning system. Here are some suggestions.

Synchronous communication can be planned into a course by setting time slots for some of the video lectures. Typically, two time slots per day are enough to cater for all time zones. It is essential in this case to embed also synchronous communication into the video itself, in particular activities for the students, like polls. Moreover, in many cases online courses have a geographical clustering of the participants, such that occasional face to face meetings are possible. A clever move in this context is to motivate the students to invite their friends and family into the course such that physical meetings can work out more easily.

Of course, synchronous communication has to be planned for in the course design, such that as a result the retention rate for the learning really is improved above the one-way messages.

Finally, introducing synchronous communication would also introduce a need to teach about how to handle such discussions in a learning context. Effective work in groups needs special processes to check into the group (presenting your personal status), both in a face-to-face and in an online synchronous setting.

## 7 CONCLUSION

From the online communication patterns identified from the online learning courses studied in this paper, the following conclusions have been arrived at. First, in online learning systems, the first message to be sent is the most difficult one. So it might be a good idea to focus on the first message specifically. Second, 20% of the participants contribute about 80% to the message traffic. This means there has to be enough traffic in total to allow students to be

active even if they are not among the most active 20%. Third, Facebook and similar systems are optimized towards discussions with short time horizon and small number of exchanged messages. They are not equally good at other forms of communication like one-way communication or co-creation. Fourth, a good communication for learning needs both a joint discussion area for all learners, and a learning group communication area for smaller learning groups. Fifth, synchronous communication should also be emphasized in the platforms and more importantly in the course design.

Creation can lead to meaningful learning within learning groups. Many online learning discussion platforms are built in a Facebook like setup, which makes it difficult for learners to create knowledge. A proper way to support co-creation of artifacts and of knowledge will advance online learning systems a lot.

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## REFERENCES

- Aguti, J. N., & Fraser, W. J. (2006). Integration of Information Communication Technologies (ICTs) in the Distance Education Bachelor of Education Programme, Makerere University, Uganda. *Online Submission*.
- Anderson, T. (2003). Modes of Interaction in Distance Education: Recent Developments and Research Questions. In M. Moore & G. Anderson (Eds.), *Handbook of Distance Education*. (pp. 129-144). NJ: Erlbaum.
- Ashley, D. (2009). *A Teaching with Technology White paper. Collaborative Tools*. Retrieved on November 1, 2014 from [http://www.cmu.edu/teaching/technology/whitepapers/CollaborationTools\\_Jan09.pdf](http://www.cmu.edu/teaching/technology/whitepapers/CollaborationTools_Jan09.pdf).
- Ayala, G., & Castillo, S. (2008). *Towards computational models for mobile learning objects*. Paper presented at the Wireless, Mobile, and Ubiquitous Technology in Education, 2008. WMUTE 2008. Fifth IEEE International Conference on.
- Collison, G., Elbaum, B., Haavind, S., & Tinker, R. (2000). *Facilitating online learning: Effective strategies for moderators*: ERIC.
- Dictionary, C. (2008). Cambridge Advanced Learner's Dictionary: PONS-Worterbucher, Klett Ernst Verlag GmbH.

- Dunbar, R. (2010). *How many friends does one person need?: Dunbar's number and other evolutionary quirks*: Faber & Faber.
- Gonçalves, B., Perra, N., & Vespignani, A. (2011). Modeling users' activity on twitter networks: Validation of dunbar's number. *PloS one*, 6(8), e22656.
- Li, Q., Lau, R. W., Popescu, E., Rao, Y., Leung, H., & Zhu, X. (2016). Social Media for Ubiquitous Learning and Adaptive Tutoring [Guest editors' introduction]. *IEEE MultiMedia*, 23(1), 18-24.
- Ludvigsen, S., & Mørch, A. (2009). Computer-supported collaborative learning: Basic concepts, multiple perspectives, and emerging trends, in *The International Encyclopedia of Education*, 3rd Edition, edited by B. McGaw, P. Peterson and E. Baker, Elsevier (in press).
- Mayende, G., Isabwe, G. M. N., Muyinda, P. B., & Prinz, A. (2015b). *Peer Assessment Based Assignment to Enhance Interactions in Online Learning Groups*. Paper presented at the International Conference on Interactive Collaborative Learning (ICL), 20-24 September 2015, Florence, Italy.
- Mayende, G., Muyinda, P. B., Isabwe, G. M. N., Walimbwa, M., & Siminyu, S. N. (2014). *Facebook Mediated Interaction And Learning In Distance Learning At Makerere University* Paper presented at the 8th International Conference on e-Learning, 15 – 18 July, Lisbon, Portugal.
- Mayende, G., Prinz, A., Isabwe, G. M. N., & Muyinda, P. B. (2015a). *Supporting Learning Groups in Online Learning Environment*. Paper presented at the CSEDU 2015 - 7th International Conference on Computer Supported Education, Lisbon, Portugal.
- Mayende, G., Prinz, A., Isabwe, G. M. N., & Muyinda, P. B. (2017). Learning Groups for MOOCs Lessons for Online Learning in Higher Education. In M. E. Auer, D. Guralnick, & J. Uhomoihi (Eds.), *Interactive Collaborative Learning: Proceedings of the 19th ICL Conference - Volume 1* (pp. 185-198). Cham: Springer International Publishing.
- Mehrabian, A. (1971). *Silent messages* (Vol. 8): Wadsworth Belmont, CA.
- Meinel, C., Willems, C., Renz, J., & Staubitz, T. (2014). Reflections on enrollment numbers and success rates at the openhpi mooc platform. *Proceedings of the European MOOC Stakeholder Summit*, 101-106.
- Munguatosha, G. M., Muyinda, P. B., & Lubega, J. T. (2011). A social networked learning adoption model for higher education institutions in developing countries. *On the Horizon*, 19(4), 307-320.
- Muyinda, P., Mayende, G., & Kizito, J. (2015). Requirements for a Seamless Collaborative and Cooperative MLearning System. In L.-H. Wong, M. Milrad, & M. Specht (Eds.), *Seamless Learning in the Age of Mobile Connectivity* (pp. 201-222): Springer Singapore.
- Salmon, G., Gregory, J., Lokuge Dona, K., & Ross, B. (2015). Experiential online development for educators: The example of the Carpe Diem MOOC. *British Journal of Educational Technology*, 46(3), 542-556.
- Salmon, G., Pechenkina, E., Chase, A. M., & Ross, B. (2016). Designing Massive Open Online Courses to take account of participant motivations and expectations. *British Journal of Educational Technology*.
- Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. *Cambridge handbook of the learning sciences*, 2006.
- Tuckman, B. W., & Jensen, M. A. C. (1977). Stages of small-group development revisited. *Group & Organization Studies*, 2(4), 419-427.
- Turkle, S. (2012). *Alone together: Why we expect more from technology and less from each other*: Basic books.
- Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes*. Cambridge: Harvard University Press.