

Collaboration in online discussion forums: An activity theory-driven model for managing socio-cultural influences, illustrated by a case study

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Abstract

Online discussion forums provide teachers and learners with powerful opportunities for collaborative teaching and learning. In open distance learning environments, a forum brings together students from diverse cultural backgrounds, and the fragility of social processes cannot be ignored. This article reports on the application of an Activity Theory-driven model that was specifically developed to manage socio-cultural influences that impact on forum collaboration. Using a case study approach and data collected from quantitative and qualitative sources, the article provides a narrative account of the facilitator's experiences in managing the forum component of a 2nd-year Internet Programming module offered at the University of South Africa. Use of the model fostered informed and consistent decisions about the objects and goals of the forum, and helped the facilitator define teaching, cognitive and social strategies appropriate to the student profile.

INTRODUCTION

Online discussion forums (ODFs) are frequently employed in open distance learning (ODL) environments to provide a meeting place where educator-to-learner and learner-to-learner open discussions can take place on course content and activities. In the process, opportunities for collaborative teaching and learning occur.

Management of ODFs is not a trivial task. A forum management model (FMM), proposed by van der Merwe, van der Merwe and Venter (2010), is particularly aimed at identifying and managing socio-cultural influences that impact on the value and utility of ODFs. However, the FMM had not been extensively tested

in real world settings. This study describes a full-scale application in the ODL-environment of the University of South Africa (UNISA), where an ODF forms an integral part of the delivery model. The application domain was an Internet Programming module with a diverse student body.

BACKGROUND

The conceptual basis of this study arises from two literature areas, namely, (a) the roles of ODF facilitators in creating ideal conditions for collaborative teaching and learning, and (b) the significance of socio-cultural influences in online endeavours.

ODF facilitators

Facilitators are vital to the processes and activities of an ODF (Romiszowski and de Haas 1989; Ahern, Peck and Laycock 1992; McMahon 1997; Zorfass et al. 1998; Li 2004). Their roles are described by Mazzolini and Maddison (2003) as that of ghost, sage or guide, and by Gray and Tatar (2004) as facilitator, moderator, and guru (expert). The role depends on the context, with each role having its own shortcomings and benefits. Warms, Cothrel and Underberg (2000) describe the optimal role by stressing the need for active management through constant iteration and innovation, measurement and target improvement. Core elements are practical aspects such as programme creation, execution and iteration, while supporting processes (active listening, interpretation, measurement and reporting) provide the information to drive the iterative cycle. Active management also involves providing expertise, appropriate tools, processes for all elements of the community, infrastructure and scaling.

Socio-cultural influences

The importance of socio-cultural influences in online communities is emphasised in the literature (Yamagata-Lynch 2001; Grossman, Wineburg and Woolworth 2000; Barab 2003; Kling and Courtright 2003; Chen, Hsu and Caropreso 2006). Students from diverse cultural backgrounds have different customs, assumptions, beliefs, values, rules, norms, practices, arts and skills that define and guide their relationship with others (Brazzel 1991). One can therefore, not ignore the fragility of the social processes in online communities (Kling and Courtright 2003). Pardalis and Girod (2006), in specifically referring to 'communities of inquirers' (such as that offered by an ODF), state that the emergence of a community is not an automatic happening that can take place in just any environment. A

community-of-inquiry approach, with its emphasis on collaboration, shared experience and participation, is intended to offer a robust theoretical basis for the design of culturally-specific environments in order to address the needs of culturally-diverse learners (McLoughlin 1999; McLoughlin and Oliver 2000). As Schagler and Fusco (2003) argue, online communities are generally created in isolation from the communities within which the participants operate, and there are socio-cultural preconditions that needs to be considered to prevent ‘us from putting the cart before the horse’. Hence Derry et al. (2001) recommend that any attempt to design an online community should respect the context and consider a careful analysis of local conditions.

All these perspectives have been considered, and are present in the FMM model of van der Merwe et al. (2010). The focus of the FMM is to provide the ODF facilitator with an explicit framework to identify and actively manage the socio-cultural aspects. This article discusses a recent application of the FMM in an ODL environment, by providing a narrative walk-through of the key flow process of the model applied in a 2nd-year module offered by the School of Computing at UNISA, where an ODF form an integral part of course delivery and participation. In describing the processes and outcomes, potential ODF facilitators are provided with meta-information on ODF management.

Research design and theoretical framework

The primary aim of this study is to report on a real-world application of the forum management model of Van der Merwe et al. (2010) in an ODL-environment.

To this end we first set out the research design which, according to Creswell (2009), has three components: a *philosophical world view*, *strategies of inquiry* and *research methods*.

Philosophy

The underlying philosophy behind the FMM is a *pragmatic* worldview (Creswell 2009) in the form of Activity Theory (AT) (Engeström 1987). It was inspired by Vygotsky (1962), who proposed that consciousness is situated not within individuals but in the interaction between individuals and objective forms of culture created by labour of mankind. Leontiev (1978) proposes a tri-stratal analysis of social activity to represent the interrelationships between context and participants as interactants in communicative events (such as ODFs). This is depicted in Figure 1.

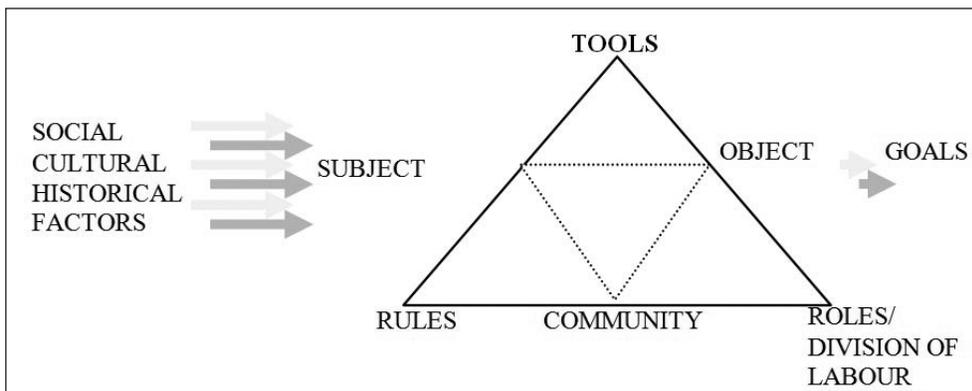


Figure 1: The Activity Theory tri-stratal framework

Whereas traditional cognitive research paradigms attempt to control the multiple factors that influence success of endeavours, AT operates within the social-historical context of the individual and the collective, thus affording a much broader view. AT reflects on human activity where a *subject*, who is motivated toward the solution of a problem or purpose (*object*), is mediated by *tools* in collaboration with others (*community*). The structure of the activity is constrained by socio-cultural factors, including conventions (*rules*) and social strata (*roles/division of labor*) within the context (Ryder 1999). Each activity that the *subject* performs is analysed within the social-cultural context of the individual as part of the collective.

One of Engeström's (1978) original motivations for developing the framework was to assist researchers identify, manage, and overcome inner contradictions (tensions) arising from participants' socio-cultural settings. For example, if a student (*subject*) has no access to an ODF (a *tool*), owing to lack of Internet access (another *tool*), it creates tension that brings the activity into instability. To overcome the tension, the *object* must change focus to resolve the tension. In pursuing stability, the other components necessarily adopt new perspectives. The new *goal* must be reached before the original *object* and *goal* can be pursued.

In an attempt to correlate context and participants as interactants in an ODF, the FMM adopted an AT-driven perspective. This allows the ODF facilitator to better understand what is happening in the transaction boundaries, and leads to improvements in the teaching, cognitive and social strategies that are employed to create and ensure optimal conditions for purposeful collaboration.

Strategy of inquiry

The selected strategy is a *case study* (Creswell 2009) of an implementation of the FMM, in which the researchers explore events, activities, processes and

individuals in depth. The approach comprises both qualitative and quantitative techniques.

Research methods

The study employed *mixed methods* (Creswell 2009) to investigate the FMM in managing an ODF in an ODL setting. Data collection methods included:

- Quantitative data: data retrieved from university databases and information extracted from the ODF database using structured query language and responses to closed-ended survey questions. Simple descriptive statistical analysis was conducted.
- Qualitative data: this incorporated secondary data from research literature, discussions with colleagues, as well as primary data collection from students' responses to open-ended survey questions and interpretation thereof.

CASE STUDY: APPLICATION OF THE FORUM MANAGEMENT MODEL

Forum Management Model

The original FMM, which was developed in the context of purposeful online continuous professional development of mathematics teachers, has been slightly customised and remapped to fit the current context. The main differences between this newly-mapped model, presented in Figure 2, and the original model are indicated at the top right of Figure 2, where markers for socio-cultural sensitivity have been added. The original evaluation scheme, which had suggested several markers for evidence of community-formation and that required in-depth analysis of transcribed text, is replaced at the bottom right of Figure 2, with simpler evaluation methods. Some of the wording of elements of the model have also been changed, but without detracting from the intentions of the original model.

The newly-mapped FMM is presented in Figure 2.

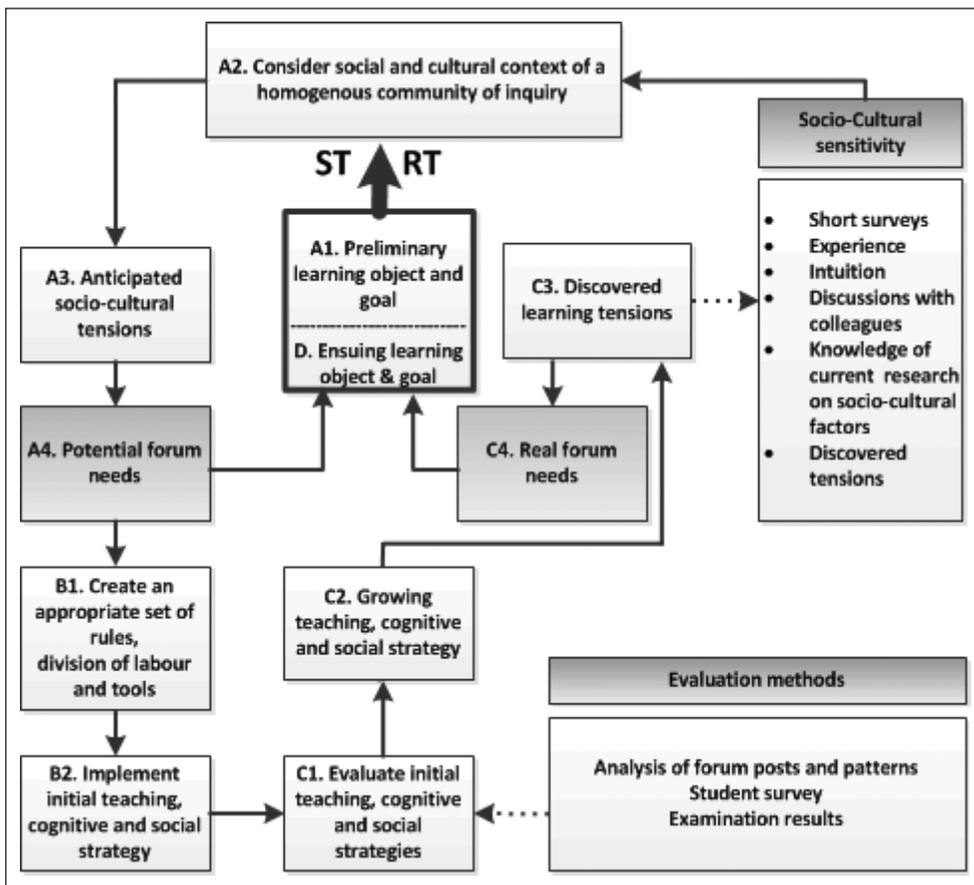


Figure 2: Activity Theory-driven Forum Management Model

The key flow processes of this model (A to D) are explained by way of a narrative walk-through of a recent application by the first author (hereafter termed ‘facilitator’), who makes extensive use of ODFs in presenting several Internet programming modules.

Case study setting

The FMM was applied in a 2nd-year Internet programming semester module (IPM) offered by UNISA as part of a 3-year diploma programme. The IPM was renewed in 2011, both in the core content and in the delivery model. The module is practically oriented; students are required to submit a portfolio in the form of a programmed Internet application running on a live server. The ODF component of the IPM is designed to provide opportunities for online collaboration within traditional distance-based delivery. The ODF’s primary purpose is to demonstrate and instill in students the value of online collaboration for programmers.

The walk-through that follows, focuses on the facilitator's perspective in applying the model in this case study and refers explicitly to each process.

Consider the community (A1 - A4)

- **A1:** The facilitator defined a *preliminary learning object and goal*. Since programming allows individual approaches to coding, the preliminary *object* was purposeful collaboration in the ODF regarding various programming approaches and solutions. Purposeful collaboration occurs when peers mutually ask and obtain information from one another and the lecturer; evaluate ideas; and monitor each other's work. The preliminary *goal* was to improve students' programming skills.
- **A2:** The *social and cultural context* of a homogenous community of inquiry, informed by several sources, was considered.
 - Although Internet access is a requirement for course registration, it does not imply that students have *ease* of access. Data extracted from the university's information system established that 85 per cent of the IPM student body is previously disadvantaged. This raised immediate concern, as independent research readings by the facilitator (termed theoretical sensitivity) indicated that only 4.6 per cent of previously disadvantaged people access the Internet on a monthly basis (APMS 2008). While 84 per cent of students lived in urban areas with access via Internet Cafés and/or UNISA laboratories, cost (Internet Cafés) and time (UNISA computer laboratory Internet access is station- and time-limited) may hinder optimal collaboration. Research by Pitout (2005) on electronic media usage patterns of Unisa Communication Science students was consulted, but the results were based on a 2000 survey when Internet access was less readily available. Furthermore, with the implementation of ODL, the student profile of UNISA has changed notably.
 - Previous working experience in disadvantaged educational settings and theoretical sensitivity to socio-cultural factors in learning has sensitised the facilitator to realities faced by disadvantaged students. A classic study by van Heerden (1995) explored the influence of socio-cultural factors on study and performance of disadvantaged UNISA students. Although dated, the effects of apartheid linger, and some of the results may still be relevant. Students' performance was found to be related to socio-cultural and other factors, including: (1) inadequate conditions in schools, (2) unfamiliarity with the tertiary culture of learning, (3) inefficient learning styles, (4) problems with planning and regulating studies, (5) ineffective use of time, (6) language difficulties and (7) economic and physical environmental factors.

- In an effort to gain further understanding of this specific student profile, discussions were initiated with colleagues who presented other modules in the same diploma programme. Several mentioned that many students do not read tutorial letters fully, and only focus on information that relates to assessment requirements, and pursue minimum requirements to pass modules.
- **A3:** Given the above considerations, the facilitator *anticipated the following socio-cultural tensions*:
 - complexities in Internet access, due largely to ethnographic factors; and
 - a tendency to pursue minimum requirements.

These two issues in tandem were likely to impact negatively on ODF visits, collaboration and hence, on teaching and learning. A cursory investigation into previous ODF use by this specific student body was therefore, initiated. Previous patterns revealed a question-answer approach (merely requesting information) with multi-posting (repetitive queries) across topics, indicating that they had not spent time in ODFs, nor read peer postings, nor searched independently for solutions. By contrast, they had appeared to view ODFs as a quick one-stop-solution centre. The consequence was disorder in the flow of ODF topics, with little meaningful collaboration. This form of disorder, and the absence of structure and logical flow, may force students to spend longer durations in online searches to access information, leading to a no-win situation and reinforcing the tension.

- **A4:** These anticipated socio-cultural tensions provided a clue to *potential forum needs*; namely, the students' requirement for access to quick-fix solutions, which is counter-productive to the stated *object* of purposeful collaboration. A redefinition of the initial *object* and *goal* was required. The ensuing *object* was to maintain (and even force) order in the ODF. The ensuing *goal* was to create optimal conditions, wherein collaborative activities (posing meaningful questions, evaluating peers' ideas, monitoring one another's work) could be nurtured. With such adaptations, the original *goal* and *object* are not discarded, but they can be pursued only once the ensuing *goal* and *object* have been satisfied. This redefinition presents an inner cycle that can be repeated until it occurs between *object* and *goal*, between *subject* and *community*, and between any further anticipated tensions and anticipated forum needs. Here the nature of the ensuing *object* prevented a second inner cycle, due to the fact that order had to be reached before initiation of a further cycle.

Strategy adjustment (B1 -- B3)

- **B1--B2:** Based on the result of this first inner cycle of anticipated needs, and also in an attempt to manage and resolve the anticipated tensions, an appropriate set of *rules*, *division of labour* and *tools* was created, which presented an *initial teaching, cognitive and social strategy*. In order to maintain order and maximise access to relevant topics, students were given a *tool* in the form of strict *rules* explaining how to create useful and informative forum topics and how to prevent multi-posting (repetitive queries). The students were informed that deviations from the rules would be dealt with strictly. These *rules* were repeated in a sticky post, ‘pinned’ near the top of the forum index for high visibility and to avoid ‘burial’ by newer posts.

The *division of labour* reflected the original *object* and *goal*, with a call for students to collaborate, along with an explanation of collaboration and an outline of the expectations for question-answer type posts. Students had to provide evidence of personal efforts before suggestions or answers would be provided. A realignment of the facilitator’s role occurred towards interventions that were more instructor-driven (Mazzolini and Maddison 2003), in contrast with the desired ethos of a learner-initiated environment.

To further ensure that student’s limited Internet time available was spent on meaningful collaborative activities, blended approaches were maximised. With the necessary permissions from owners, relevant Internet-resources were extracted from websites and made available to students on a Compact Disk (CD). In this manner, students were provided with fully functional and comprehensive off-line versions of web-based tutorials, PC-based server environment software for portfolio development and testing, directions for creating and managing free web server hosting accounts, as well as programming manuals and reference-software that is only available online, to complement the prescribed book.

Evaluation (C1 -- C4)

- **C1:** Once implemented, the *initial teaching, cognitive and social strategy* was *evaluated*. Despite the clearly stated *rules* and instructor-driven interventions, disorder initially reached serious levels. Students persisted with the question-answer approach, posted poorly-defined topics, and hijacked existing topics and threads by posting unrelated questions, thereby limiting opportunities for purposeful collaboration. Except for a few dedicated students, there was little evidence of productive collaboration. However, there was a slight improvement as the semester progressed.

On completion of the semester, we conducted a more formal evaluation.

Quantitative data collection and analysis: Firstly, simple descriptive statistical analysis was conducted on ODF posts and patterns, as structured query language was used to probe the ODF database.

The IPM ODF returned the 3rd-highest post total of 76 module ODFs in the School of Computing, which was encouraging. Eighty-two topics had been created, 16 by the instructor. In total, views of all topics came to 18 201, which was equally encouraging. There were 167 registered IPM students, and a total of 767 posts were made by 79 users (78 students and the instructor). However, 40 per cent of the posts were contributed by the instructor (224) and the top student participant (68). Further analysis revealed the mean number of posts per student to be a low 6.58 (SE=1.22, with a minimum of 1 and a maximum of 68).

Frequencies of posts, presented in Table 1, were more revealing.

Table 1: Frequencies of student posts

Number of posts	1	2-5	6-10	11-15	16-20	>20
Number of students	39	16	9	5	4	5

Table 1 shows that 55 (39+16) of the 78 students (71%) have contributed less than 5 posts over the semester, with 39 (50% of those who participated) having contributed a single post only.

Qualitative data collection and analysis

Since purposeful collaboration on a topic can be achieved with single posts from many students, we decided to obtain additional data and conduct further evaluation by administering a survey to the 92 students who had submitted the formative portfolio on their ODF use and experiences.

A response rate of 47 participants (51%) was achieved, providing the following statistics on their profile: (1) 64 per cent were previously disadvantaged, (2) 98 per cent lived in or around an urban area, (3) 49 per cent were from a lower-income group and (4) 49 per cent from a middle income group, and (5) 12 per cent described their schooling as poor, 72 per cent as standard, and only 12 per cent as high quality.

Internet connectivity turned out to be less of an issue than anticipated. Table 2 shows that the majority of students (70%) have access to the Internet through a PC. They used a variety of access points, with the workplace (61%) being

another major access point. Cell phones are largely employed as modems and not as browsers.

Table 2: Students' Internet access

Access point	Count	Percentage (n=47)
My own personal computer	33	70%
An Internet Cafe	12	26%
Unisa computer laboratory	7	15%
Satellite campus	0	0%
Friend	2	4%
Cell phone	24	51%
Work	29	61%
Other	1	2.13%

Further analysis revealed that only five students had just a single Internet access point (4 from work and 1 from a UNISA computer laboratory). In answering an open-ended survey question, only 7 students (15% of the respondents) specifically cited problems in Internet access/cost/time as a reason for not visiting the ODF regularly. Whereas the data confirmed much of the anticipated student profile, it indicated an underestimation on our part on the students' ease of Internet access -- it was not as limited as we had anticipated.

We also studied student responses to open-ended survey questions, and gained much insight regarding the value and usefulness of the ODF.

With the exception of three students, all the others indicated that socio-cultural factors did not prevent optimal participation, but rather motivated them to work harder and succeed.

Some responses confirmed the disorder initially identified:

The forum was good overall, except I would have liked a team of moderators to keep the whole forum organized. There are so many students creating a bunch of useless threads, and it is a lot of work for only one lecturer to keep it in good order.

... just needs a little bit of order.

People must first see what has been written by others before writing to avoid duplication of comments or questions.

The topics were sometimes too long, and when accessing the info via internet at work, one does not have sufficient time to read all the comments and try to enhance one's program

The lengthy topics resulted from topic hijacking, which makes it very difficult for students to collaborate and/or find solutions to problems. The following responses highlighted the success of instructor-driven strategies:

My experience with the forum is that it was very helpful. We could help each and the lecturer availability to answer questions was excellent.

It's very helpful as long as you understand what is going on, then you will value it because you know what they are talking about and the lecturer responds compared to other module lecturers.

It was great to have an active lecturer on the forum!

... the lecturer has a wide range of knowledge, quick to respond to questions and always willing to help

The strict implementation of the rule, 'Topics that do not follow the rules will be ignored', and the firm stance on addressing transgressions, may have had an unintended consequence, as three students indicated they were afraid to ask questions:

It's good because the lecture interacts with the students regularly, but I also think he has too high expectations and that makes us scared to post some questions because he might find them silly.

The forum to me is very helpful but sometimes I (maybe other students as well) feel intimidated before even posting the question, because I am not sure if I am not going to get a negative response from the lecturer because I have asked a stupid sounding question or a question with an obvious answer (should have known the answer to that question).

I feel the lecturer was a bit "hard" on some comments.

However, these comments must be judged against other responses that support the contentions of the facilitator's colleagues that some students do not immerse themselves in their studies and are interested only in passing the module:

The forum allows students to interact with other students, but as a part time student you expect the lecturer to give you the insight of the whole thing.

Most users have no clue how to use forums productively.

I did participate, but not as much as I would like to, mainly because of... too many threads with useless yelling and saying "HELP ME".

Many people posted stupid questions and were not willing to try anything themselves, so those students should be left to troubleshoot themselves and come back with meaningful step-by-step and code snippet questions.

Other comments suggest that a degree of collaboration was achieved or that, at the minimum, the importance and value of collaboration was understood:

The forum is very important if you are actively involved.

I enjoyed using the forum. As an experienced programmer I helped other students on the forum with problems they might have had. That was actually the only reason why I used the forum, to help fellow students solve their problems.

It is very helpful though, because some students are very helpful.

The forum adds a lot of value and information to the course. It is nice to know that if you are struggling with something specific, then maybe someone else encountered the same problem and the answer might be in the forum. If it's not, you can easily and anonymously discuss it with your fellow students.

A specific question on the value of the ODF returned 19 responses that included words such as *extremely valuable, invaluable, extremely useful* etc. A further 24 responses included words such as *helpful, good, helpful to a certain extent/sometimes* etc.

As a final evaluation, the formative portfolio rate was considered. The student pass rate was a low 45 per cent. However, 32 students submitted plagiarised portfolios, and if these are ignored, the pass rate was a credible 63 per cent, which is notably higher than the 45--60 per cent pass rate achieved in other 2nd-year modules.

Summary of the findings

In summary, there was sufficient evidence from the evaluation that the ODF, despite the initial disorder, was valuable and that some students clearly understood the importance of ODF order and the value of collaboration itself. The strategies employed were therefore considered effective.

- **C2:** Based on the outcome of the evaluation, the *teaching, cognitive and social strategies were updated* (hence the term ‘growing’). It emerged that students were gradually complying with the stated *rules* and *division of labour*. Given the short semester time frame to instill the value of order and collaboration, the strategies employed were retained for a next semester.

The diploma programme includes an ODF-driven Advanced IPM at 3rd-year level; therefore, the know-how is carried over. Furthermore, the ODF runs on a server outside the formal myUnisa system, which does not allow the posting of formatted programming code. Students new to programming ODFs therefore have access to, and are encouraged to visit previous ODFs (which myUnisa does not allow), which serve as knowledge repositories and demonstrate what is required by ODF participation. An informal assessment of the second semester ODF (at the time of writing) shows continuing improvement in order, topic themes and collaborative efforts.

We take note of comments that some students are afraid to ask questions, as well as the request for further facilitators. The latter can be achieved by obtaining student assistance to help maintain order. The services of three astute IPM students have been secured to fulfill this role in 2012.

- **C3--C4:** The preceding processes result in *discovered learning tensions*, pointing at students’ *real forum needs*. Socio-cultural tensions impact on the way students approach and participate in the ODF. It emerged that the cohort did not have major Internet access problems, and that their socio-cultural backgrounds motivated them to work harder. However, the learning tension identified was a lack of solid academic resolve or aptitude. Students’ real need in the ODF is education on, and guidance towards, academic scholarship. This highlights the importance and role of ODFs in ODL environments, since they can provide platforms for lecturers, from which they can actively engage students and support them in their journey towards academic scholarship.
- **D:** Besides adding to the facilitator’s socio-cultural sensitivity in a next cycle, this discovery resulted in an *updated (ensuing) object and goal* (implemented

in the second semester) to include nurturing academic scholarship and the establishment of a learning ethos beyond course content. As an immediate step, a tutorial letter was distributed that explained the importance of academic resolve in pursuing a goal-oriented career, as well as the role of ODF collaboration in achieving this.

CONCLUSION

The primary purpose of this article, as explained in the section on research design, was to report on a real-world application of the FMM (Van der Merwe, van der Merwe and Venter 2010 2010) in an ODL-environment.

By providing a narrative walk-through of the key flow process of the model as it was applied in a 2nd-year module, we demonstrated how operationalising the management of socio-cultural influences in an ODF removed speculation regarding the socio-cultural issues encountered by students. Discerning observation, appropriate instructor-intervention and dual-method evaluation helped us towards understanding and improving the complex relationships between socio-cultural influences and their impact on fruitful collaboration. More importantly, the use of the model fostered informed and consistent decisions about our objects and goals, and helped us define teaching, cognitive and social strategies that are appropriate to the student profile.

How we perceived the processes and applied the model is subjective, and could be customised differently, but the adoption of a socio-cultural perspective afforded a broader view that is not routinely attained in ODF transactions. It is a construct that cannot be ignored by academics if an ODF is used as a tool for collaborative teaching and learning.

REFERENCES

- Ahern, T. C., K. Peck and M. Laycock. 1992. The effects of teacher discourse in computer-mediated discussion. *Journal of Educational Computing Research* 8(3): 291--309.
- APMS. 2008. *South African Advertising Research Foundation Report*. Available at: <http://www.saarf.co.za/> (accessed August 2010).
- Barab, S. A. 2003. An introduction to the special issue: Designing for virtual communities in the service of learning. *The Information Society* 19(3): 197--201. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.156.3658&rep=rep1&type=pdf> (accessed 30 November 2010).

- Brazzel, M. 1991. Building a culture of diversity in the cooperative extension system: A paper to foster dialogue and discussion about pluralism in extension. ECOP and ES-USDA National Diversity Strategic Planning Conference, Denver, Colorado, September 1991.
- Chen, S. J., C. L. Hsu and E. J. Caropreso. 2006. Cross-cultural collaborative online learning: When the west meets the east. *International Journal of Technology in Teaching and Learning* 2(1). Available at: <http://www.sicet.org/ijttl/currentissue.html> (accessed 20 January 2011).
- Creswell, J. W. 2009. *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications, Inc.
- Derry, S., J. Lee, J. Kim and J. Seymour, J. 2001. Communities of enquiry among pre-service teachers investigating mathematics. *Annual Meeting of the American Educational Research Association*. Seattle, WA.
- Engeström, Y. 1987. *Learning by expanding*. Helsinki: Orienta-Konsultit Oy.
- Gray, J. H. and D. Tatar. 2004. Sociocultural analysis of online professional development. In *Designing for virtual communities in the service of learning*, ed. S. A. Barab, R. Kling and J. S. Gray, 404--435. Cambridge: Cambridge University Press.
- Grossman, P., S. Wineburg and S. Woolworth. 2000. What makes teacher community different from a gathering of teachers? An occasional paper. *National Research Center on English Learning and Achievement: Center for the Study of Teaching and Policy*. Seattle, WA. Available at: <http://java.cs.vt.edu/public/classes/communities/readings/Community-GWW-01-2001.pdf> (accessed on 15 November 2010).
- Kling, R. and C. Courtright. 2003. Group behaviour and learning in electronic forums: A socio-technical approach. In *Building online communities in the service of learning*, ed. S. Barab, R. Kling and J. Gray, 91--119. Cambridge University Press. Available at: <http://www.informaworld.com/index/713856968.pdf> (accessed 2 February 2011).
- Leontiev, A. N. 1978. *Activity, consciousness, and personality*. Hillsdale: Prentice-Hall.
- Mazzolini, M. and S. Maddison. 2003. Sage, guide or ghost? The effect of instructor intervention on student participation in online discussion forums. *Computers & Education* 40(3): 237--253.
- Li, Q. 2004. Knowledge building community: Keys for using online forums. *Journal of Technology & Teacher Education* 48(4): 24--29.
- McLoughlin, C. 1999. Culturally responsive technology use: Developing an online community of learners. *British Journal of Educational Technology* 30(3): 231--245. Available at: <http://www.wiley.com/bw/journal.asp?ref=0007-1013> (accessed 4 February 2011).

- McLoughlin, L. and R. Oliver. 2000. Designing learning environments for cultural inclusivity: A case study of indigenous online learning at tertiary level. *Australian Journal of Educational Technology* 16(1): 58--72. Available at <http://ascilite.org.au/ajet/ajet16/mcloughlin.html> (accessed 2 February 2011).
- McMahon, T. A. 1997. From isolation to interaction: Network-based professional development and teacher professional communication. *Annual Meeting of the American Educational Research Association*, Chicago, IL.
- Pardalis, M. J. and G. Girod. 2006. Community of inquiry: Its past and present future. *Educational Technology and Theory* 38(3): 299--309.
- Pitout, M. 2005. The electronic media usage patterns of Unisa Communication Science students: An exploratory survey. *Progressio* 27(1&2): 73--83.
- Romiszowski, A. J. and J. A. de Haas. 1989. Computer mediated communication for instruction: Using e-mail as a seminar. *Educational Technology* 24(10): 7--14.
- Ryder, M. 1999. Spinning webs of significance: Considering anonymous communities in activity systems. *Fourth Congress of the International Society for Cultural Research and Activity Theory*. Aarhus, Denmark.
- Schagler, M. S. and J. Fusco. 2003. Teacher professional development, technology, and communities of practice: Are we putting the cart before the horse? *The Information Society* 19:203--220.
- Yamagata-Lynch, L. C. 2001. *Community of practice: What is it, and how can we use this metaphor for teacher professional development?* National Convention of the Association for Educational Communications and Technology, Atlanta, GA.
- Van der Merwe, T. M., A. van der Merwe and L. Venter. 2010. A model to direct online continuous professional development opportunities for mathematics teachers in the South African context of disparities. *Journal of the Southern African Association for Research in Mathematics, Science and Technology Education (AJRMSTE)* 14(3): 63--78. Available at: http://www.sabinet.co.za/abstracts/saarmste/saarmste_v14_n3_a6.html (accessed 5 April 2010).
- Van Heerden, E. 1995. Black university students in South Africa: The influence of sociocultural factors on study and performance. *Anthropology & Education Quarterly* 26(1): 50--80.
- Vygotsky, L. S. 1962. *Thought and language*. New York/London: Wiley/MIT Press.
- Warms, A., J. Cothrel and T. Underberg. 2000. *Active Management: The discipline of successful online communities*. Available at: <http://www.delijst.net/delijst/pdf/activemanagement.pdf> (accessed 3 September 2010).
- Zorfass, J., A. Remz, J. Gold, D. Ethier and P. Corley. 1998. Strategies to ensure that online facilitators are successful. *Annual Meeting of the American Educational Research Association*, San Diego, CA.