Abstract
This paper looks at the effectiveness of staff development in the framework of the MASTERY project at three universities in Yemen, in Sana’a, Thamar and Al-Hodeidah. It uses a model for the evaluation of professional development by Guskey. This model evaluates professional development at five different levels: 1 participants’ reactions, 2 participants’ learning, 3 organisational support, 4 participants’ use of new knowledge and skills, and 5 student learning outcomes. At the five levels the paper reconstructs the achievements made at the universities from project reports, workshop evaluations, observation reports of lectures and practical sessions. At the levels 1 and 2 the achievements have been excellent. There is a clear appreciation of what was done and learned in introductory workshops as well as indications of learning taking place as groups of participants worked independently and under the guidance of local staff on the development of standards, new programmes, new courses and new teaching and learning methodology. However, there are significant problems at level 3, organisational support for the curriculum reform during implementation. Achievements at level 4, staff using new knowledge and skills in their day to day setting, were limited. One concern shines through in the conclusions of the paper: Without adequate grounding in a faculty, an externally funded project like the MASTERY project has very little leverage to influence the policies of a faculty and has proved to be particularly problematic when it comes to implementation of new programmes.

Context of education in Yemen
Yemen is situated at the southern part of the Arab peninsula, being bordered by Saudi Arabia and Oman, the Red Sea and Arabian Sea. The Republic of Yemen exists since the unification of North and South Yemen in 1990 and has made significant progress in its development. In the period 1975-2004 (i) life expectancy increased from about 40 to 63 years; (ii) adult literacy jumped from 10 to 49%; (iii) female illiteracy dropped from 95 to 69%; (iv) primary school enrolment rates increased from 57 to 91%; and (v) fertility rates declined from 7.9 to 6.3 births per woman. Nevertheless, the country ranked 150 out of 177 countries in the 2006 Human Development Index and 121 out of 140 countries in the Gender Development Index (World Bank, 2006).
Gross enrolment rates (GER) for primary education is 87.3% (male 100.0%; female 74.1%), GER for secondary education in Yemen is 38.3% compared to 68.7% average for MENA\(^2\) countries. The overall secondary education GER is 38.3% in Yemen as compared to 43% average for low-income countries and 68.7% average for Middle East and North Africa countries (2004/05 school year). GER are particularly low for girls, 25.9% while GER for boys is 59.8%. Both male and female GER in rural areas are well below the rates in urban areas (urban 65.8% and rural 49.4%) with a much larger difference for female students (UNESCO, 2008).

There are seven public universities in Yemen with a total enrolment (2004/05) of 174,000 students, with 27% of these female students (World Bank, 2008). Teacher education (TE) programmes are offered solely by universities, for the reason that all teachers need to be qualified at bachelor level. Earlier arrangements whereby teacher education institutes offered courses for teachers of primary and junior secondary education have been discontinued. Universities have continued to offer programmes for teachers at the senior secondary level, ignoring the very different needs of class teachers at primary and domain teachers at junior secondary level. TE programmes at the three universities are the responsibility of the faculties of education. TE (science and maths) programmes are executed in Sana’a and in Thamar in cooperation with the faculty of science. In Al-Hodeidah the programmes are executed by the faculty of education, which includes the chemistry and physics departments.

In an attempt to reform the teacher education programmes for science and mathematics three universities have set up the MASTERY\(^1\) project. This donor-funded project focuses on the development of science and mathematics teacher education programmes at three Yemeni universities, Sana’a University, in the capital, Hodeidah University in Al-Hodeidah on the Red Sea, and Thamar University in Dhamar, south of Sana’a, in the mountains, with the aim to expand its operations at the end of the current funding phase to include the four other public universities: Taiz, Ibb, Aden and Hadhramout.

The project has as its main goal to reform the teacher education curriculum in the sciences and mathematics at the three universities, such that teachers are better prepared when they enter the teaching profession. In addition, the project is a staff development project, focusing on developing capacity in teacher education. As such the project has a two-pronged approach. It does not only concentrate on a reform curriculum as a final product (although this is seen as a major

\(^1\) MASTERY – Mathmatics And Science Teacher Education Reform in Yemen.
\(^2\) MENA - Middle East and Northern Africa.
outcome), but it also focuses on the training of staff in curriculum development and the support of staff in the implementation of the new curriculum in lectures, laboratories and workgroup sessions.

This latter component of the project is the main focus of this article which starts with a short overview of the development process that was initiated by the MASTERY project.

Curriculum reform in the MASTERY project

The project has used a definition of Taba (1962) for curriculum as ‘a plan for learning’. The project has taken the view of curriculum and curriculum development as outlined in van den Akker (2004). Curricula can be represented in various forms. A common broad distinction can be made between the three levels of the ‘intended’, ‘implemented’, and ‘attained’ curriculum. A more refined typology is outlined in Table 1.

<table>
<thead>
<tr>
<th>Intended</th>
<th>Ideal</th>
<th>Vision (rationale or basic philosophy underlying a curriculum)</th>
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<tbody>
<tr>
<td></td>
<td>Formal/Written</td>
<td>Intentions as specified in curriculum documents and/or materials</td>
</tr>
<tr>
<td>Implemented</td>
<td>Perceived</td>
<td>Curriculum as interpreted by its users (especially teachers)</td>
</tr>
<tr>
<td></td>
<td>Operational</td>
<td>Actual process of teaching and learning (also: curriculum-in-action)</td>
</tr>
<tr>
<td>Attained</td>
<td>Experiential</td>
<td>Learning experiences as perceived by learners</td>
</tr>
<tr>
<td></td>
<td>Learned</td>
<td>Resulting learning outcomes of learners</td>
</tr>
</tbody>
</table>

The universities have used this typology as a guide for their curriculum development activities. The process of reforming the teacher education programmes at SU, TU and HU has been underway since the middle of 2005.

The complete process as it has taken shape over the project period is mapped out in Figure 1. It provides an overview of the issues which were seen as important during the intended curriculum phase, in 2005 and 2006 when the project developed a teacher education framework. The project has chosen for the development of teacher standards as a basis for coming to new teacher education
programmes at the three universities. This is in line with international practice, but also had the added advantage that working from the same standards, the three universities would be able to develop their own programmes fitting their own specific local conditions.

Figure 1 shows that the process of curriculum development has started with a context and problem analysis, including the various main issues in science and maths teacher education such as the issue of gender, the use of ICT and the role of practical work in the curriculum which were all seen as problematic (boxes left upper corner in red) and the current senior secondary education curriculum. The decision was subsequently made to develop standards (teacher, teacher education, and teacher education content) which would then serve as a basis for the development of the new programmes at the three universities. Moving from standards to new programmes manifested itself as a major step in the development process, as did the implementation of the new courses in the classrooms and laboratories. The teacher education framework also revealed a large number of issues which were outside the realm of the project. For these issues, cooperation with the ministry of education was sought. These include the need for a system of school-based teaching practice, a plan for in-service teacher education and a dissemination plan for other public universities (see boxes in the lower right of Figure 1).

The development process has mostly focused on the intended and implemented curriculum, and up to now much less on the attained curriculum, on student experiences about the new programmes and student achievements. This area of the curriculum will be the focus of attention in the final part of the project.

**Staff development in the MASTERY project**

The project chose a capacity-based strategy for the development of the new curriculum. At all levels and for all activities it made use of the staff in the science and mathematics departments at the faculties of science and education. In some cases expertise in curriculum development already existed in the department, in many other cases it did not. In such cases, external expertise was brought in to train staff who would subsequently work – together with the external experts – on products, be it standards, new programmes, courses and the like. By doing so, a large cadre of staff has been trained in the domain of curriculum development. A second area of training targeted all lecturers implementing new courses in the lecture halls, classrooms and laboratories. This group showed large overlap with the group of staff that developed the standards and the new programmes.
The design of the new programmes advocated a more active role of the students in the learning process, more emphasis on practical work, and a move towards the use of ICT in laboratory work and in lectures. The project gave considerable attention to the preparation of lecturers who would implement the courses. Their new orientation was developed via a set of workshops and working meetings before the implementation of the new programmes, and a system of follow-up assistance by local and external experts during implementation.

**Effectiveness of staff development**

Questions about the effectiveness of the staff development component of the project focus on two curriculum development stages. These are the design stage (developing the teacher education framework, new programmes and new courses) and the implementation stage (in which lecturers delivered the new courses in their classrooms). 

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*Figure 1: MASTERY curriculum development process in the three universities.*
The issue of effectiveness can be broken into two sub-questions:
• *How well did the project support the staff with the development of teacher standards, new programmes and new courses?*
• *How well did the project prepare and support the staff for, and with the implementation of the new courses?*

**Methodology**
To answer the above questions, a reconstructive approach was applied using project reports, personal notes and communications, questionnaires and reflective interviews with staff and external experts and other instruments as deemed appropriate. The study is mainly qualitative in nature and uses the model for the evaluation of teacher professional development by Guskey (2000) as its framework for analysis. The model recognises five stages in the professional development of educators (teachers and lecturers). These are:
• **Level 1** - gauges the *participants’ reactions*, usually through questionnaires following a session. Did the teachers think their time was well spent? Were the activities meaningful? Did teachers think the activities will be useful in practice?
• **Level 2** - examines *participants’ learning*; it measures the knowledge, skills, and perhaps the new attitudes teachers have acquired as a result of the professional development activities.
• **Level 3** - analyzes *organisational support* for the skills gained in professional development. Was individual change encouraged and supported? Was administrative support public and overt? Were problems addressed quickly and efficiently? Were sufficient resources made available, including time for sharing and reflection?
• **Level 4** – assesses *participants’ use of new knowledge and skills* is assessed by asking whether they are using what they learned and using it well. This type of assessment requires indicators that reveal both the degree and quality of use.
• **Level 5** – assesses *student learning outcomes* that are the end result of the professional development activity. Did students show improvement in academic, behaviour, or other areas? Did the students benefit from the activity? Were there any unintended results?

The Guskey model with its five stages is used as a guideline for developing instruments and for analysis of results.
Results
Level 1 – Participants reactions
Since 2005 a large number of workshops in support of development activities have been organised. Many of these were organised to introduce new topics as part of programme review in science and maths teacher education. At the end of many of those, participants completed a short evaluation form with a small number of questions, usually 3 questions:
What did you like most? What did you like the least? What would you have wanted more of?
In specific cases, extra questions would be added to ask about the workshop and the chances of implementation of the performed activities in teaching classes at the faculties. In almost all evaluations of this type (Box 1), a very favourable opinion surfaced among the participants. Of the above questions, the first one was usually answered most extensively, while fewer participants responded to the second question on dislikes - often focusing on realities at the faculties, such as class size, lacking equipment and uncooperative colleagues. Such responses may hint indirectly to adverse views about the workshop.

Box 1: Typical answers in evaluation of workshop activities (workshop in support of the development of subject methodology courses), Jan 2009 (n=21, 12 Arabic responses translated (English)

<table>
<thead>
<tr>
<th>Workshop participants’ responses on the topic of microteaching</th>
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<tbody>
<tr>
<td><strong>What did you like most?</strong></td>
</tr>
<tr>
<td>• How to use technology/ICT in teaching (2)</td>
</tr>
<tr>
<td>• History of science / understand the role of nature of science in teaching/relate science to society (2)</td>
</tr>
<tr>
<td>• Film about large classes</td>
</tr>
<tr>
<td>• Practical/active participation people (2)</td>
</tr>
<tr>
<td>• Informative</td>
</tr>
<tr>
<td>• Well organized/prepared (2)</td>
</tr>
<tr>
<td>• Simplification of microteaching method and show how it could be used effectively/micro teaching elements/microteaching training by individuals/ knowledge about microteaching process/ learning new ways in microteaching esp. observation/ exchange new ideas with experts was beneficial/ discussion about microteaching the activities/ I like the way of evaluate the work/ the practice of microteaching which I did and the feedback from experts and colleague (6)</td>
</tr>
<tr>
<td>• The type of demonstrations and related ideas.</td>
</tr>
<tr>
<td>• Demonstrations, discussions, practice, working together, apply theory in small groups (10)</td>
</tr>
<tr>
<td>• First day lecture on history of science</td>
</tr>
<tr>
<td>• Nearly everything</td>
</tr>
</tbody>
</table>
Box 1 (cont.): Typical answers in evaluation of workshop activities (workshop in support of the development of subject methodology courses), Jan 2009 (n=21, 12 Arabic responses translated (English).

What did you like least?
• Nothing (2)
• I wished it had been longer
• The time of the workshop, it comes in the last week of school and many people were busy with lecture/ we were absent from our lectures/ its time at the end of the semester, we have many duties in this time (3)
• Location of the workshop not enough rooms and equipment to do the activities
• I did not like that we did the microteaching ourselves. I was expecting one person from NL to give us small microteaching to know them way of teaching so we could learn more

What issues, topic, activities will still be problematic for you when executing the methodology courses, if any?
• Lack of technicians
• Lack of textbooks, labs, manuals, motivated teachers and students
• Applying various teaching process such as: discovery, concept mapping, learning cycle and so on.
• Teaching and working with large groups
• The material in some lessons need to use the expensive material
• The inquiry
• Lack of materials /not enough practical work possible/wk IIIII
• In large classes impossible to apply this kind of teaching/ switching between practicals and lectures not possible in large classes/ not all students can get attention/cost too much time / when good educational programmes were organized like teaching in small groups, it would be easier to estimate the levels and results (4)
• Application
• Other lecturers should know about this way of teaching
• Difficult colleagues, everybody did his own thing, they don’t stick to agreements, in Amsterdam more directed, now more chaotic

Did the programme meet your expectations?
• Very well
• Yes (positively)(it did) (5)
• To some extent
Level 2 – Participants learning

In many of the workshops, participants were asked to present a small section of the outcomes of the discussions and activities in small groups to the larger group to show what they found and learned. These included – for instance – exercises in which standards in science teacher education for a particular issue are being drafted. The trajectory for the development of standards for science teachers has been relatively long, with exploring knowledge and skills already present among faculty staff at the three universities, elaborating international examples of wide-ranging discussions, and first hands-on development of draft standards by staff under the guidance of local experienced staff and international consultants. Over time, the international consultants took more and more distance from development of standards, eventually it became a completely Yemeni activity. It has been a major learning curve for many staff, but the result is a set of home-grown science and mathematics teacher standards, as well as a large pool of lecturers able to develop standards in the future, and perhaps for other purposes than just teacher education programmes.

An interesting issue in the project has been the role of Islamic scientists in the early development of science. Box 2 illustrates the kind of aspects lecturers eventually were able to include in the standards.

Box 2: Items incorporated into standards on the issue of Islamic scientists and their contribution to modern science.

- Demonstrate the historical development which lead to cell discovery and the role played by Iben Alhethem in inventing magnification (cell biology)
- Show an understanding of the work of Arabic and Muslim scientists in laying the foundations of modern science (science teacher standards)
- Demonstrate the contributions of the Arab and Muslims in scientific theories and hypotheses of waves such as Ibn Al-Haitham (965-1039), Kamaal Al-Deen Al-Farisi, Qotb Al-Deen Al-Sheeraazi, and Abu Yahya Zakariya’ ibn Muhammad Al-Qazwini (physics standards).

Another example where learning of participants has been visible was in sessions where lesson plans were developed, and where teaching strategies were discussed and practiced. These sessions ended often with participants presenting short lessons in a microteaching session. Promoting an active learning style was part of the pedagogical approach of the new programmes. Where some seemed to struggle, others picked up this style with gusto and produced interesting
ideas. Clearly learning took place, but not necessarily for every participant and perhaps at the rate one would have wished. Participants’ responses on the topic of microteaching are shown in box 1 above.

From standards to programmes, programmes to course
As shown in Figure 1 the project assisted the staff at the three universities to develop new science and mathematics teacher education programmes based on the standards formulated at an earlier stage of the project. The development strategy followed a similar format: initially a large involvement by international consultants providing direction and examples of international programmes. However, as the development proceeded, the international consultants became backbenchers and faculty staff became the driving force of the development process.

Figure 2, below, shows a science content standard for cell biology as a typical example of what the standards eventually looked like.

**Science Content Standards**

1. Cell biology:

   **Knowledge and understanding**

   Newly qualified teachers should be able to:

   1.1 Demonstrate an understanding of cell theory and show an understanding of the different cell features, differentiate between plant and animal cells and classify cells as prokaryotic and eukaryotic.

   1.2 Demonstrate an understanding of biological molecules, their physical and chemical properties and their roles in the cell.

   - Isolate DNA, carbohydrates, lipids and proteins from the cells and show their presence as components of the cells.

   1.3 Relate cell morphology to function and demonstrate an understanding of cell cytosol composition and properties and of the structure and function of cell organelles and their distribution in the cell.

   - Observe and recognize chloroplasts and mitochondria by the optical microscope.

   **Gender**

   Explain the work of Gerty Theresa Cori on carbohydrate metabolism for which she received the 1947 Nobel Prize for medicine

   **ICT opportunity**

   Use animations in teaching cell biological processes

   **Figure 2**: Example of the standards developed

   A similar process evolved when it was time to develop new course descriptions for the new programmes. Again, faculty staff took centre-stage after a startup period in which the international consultants provided guidance and input. In conclusion, there is evidence that learning of participants has taken place.
Level 3 – Organisational support
Organisational support can be viewed from both the side of the project and from that of the institutions. A detailed description of the project design is beyond the scope of this paper, though previous sections have mentioned workshops, external consultants, and other activities which were coordinated from a project office by a fulltime coordinator and support staff. This section analyses institutional support for the change process.

Approval of the new programmes and courses appeared to be a laborious and difficult task. Not everybody at the faculties was convinced of the quality of the new programmes and courses. Eventually the approval process was completed, but this did not mean that the new programmes were actually implemented. Some lecturers simply carried on teaching their own courses, while one faculty appeared to move lecturers around to make sure that those who had developed the new courses were unable to teach them. On the whole, the faculties seemed unconvinced about the need to change the programmes. Some members of staff complained about the loss of content and the change in teaching approach to a more active learning pedagogy.

Project-funded equipment posed further problems. Departments seemed unable to organise the equipment so that all lecturers could make best use of it. Some staff even requested a computer and beamer for their sole use, indicating a lack of collegial cooperation and willingness to share. There is very little evidence that lecturers formed peer groups or other forms of cooperation to share ideas, prepare lectures and reflect on teaching. At best, the organisational support has been patchy and not conducive to a successful implementation of the new courses.

Level 4 – Participants’ use of new knowledge and skills
Participants’ use of new knowledge and skills was gauged by looking at how lecturers used their newly acquired skills and knowledge in teaching, both in lecture halls and laboratory settings. Through lesson observations, interviews and coaching sessions in the various departments, a picture was formed of how the implementation of the new courses was taking place, the successes and areas for improvement. Three main issues arose to do with 1) basic teaching skills and the increased focus on activity-based approaches to teaching and learning, 2) the availability of lesson materials, textbooks, lab manuals, and the like, and 3) the use of existing and ‘new’ equipment and technology.
Teaching skills
Active teaching approaches do happen in classrooms as anecdotal evidence indicates, but in the following examples the majority of cases seem to show a more traditional approach to teaching and learning (Box 3).

Box 3: Excerpts from lesson observation forms on both lecture and practical sessions

‘... Some students were following the lecture in their copies of the lecture notes, some girls were taking notes (few or no boys took notes), but there was no assigned text. Students did not ask questions, and there was little interaction among the students’.
(chemistry lecture observation report)

‘... During the theoretical introduction there was not much interaction, afterwards with half the group there was more of it. She (the lecturer) checks for understanding by asking questions. They take notes and make some drawings in a notebook’.
(biology lab observation report)

‘... The students were not enough engaged in working with the materials. They gave the impression to have seen it before (and perhaps even more effectively). Although the illustrations were good, relevant interaction between students, group discussions and activities for learning would obviously do a great job here. One wonders what was done in previous weeks’.

‘... The class was instructor-centered with some opportunities to answer questions in chorus and occasionally individually. Some students tried the exercises given on the board, but not all of them. There was no discussion amongst students or encouragement to do so. The majority seemed involved in learning, though some leaned back. Attention from the students was well spread throughout class time, with no particular focus on exercises or any other activity’.

Large classes and little space to maneuver add to the likelihood that traditional teaching and learning approaches will be used. Observers noted that a more active approach in combination with the use of modern technology would have been very useful in enhancing learning, but that this does not seem to happen on a regular basis.

Availability and use of lesson materials
‘... The instructor talked with a clear voice, but the use of the blackboard was slightly chaotic. There was no use of modern technology, nor were provisions visible. Students had no textbook. But they were not copying the examples from the blackboard either. In fact, they did not do much. Once in a while, there
was a bit of unrest when the (partly correct solution) suddenly came on the blackboard’.
‘ … The majority of students had a photocopy of a textbook (in Arabic). Some made notes on the theory. Not all of them copied the worked examples in a notebook’.

A worrying aspect is the lack of lesson materials, or if available, the undefined use of them, and the reliance on teacher notes as the main source of text. Against the background of an envisaged learning methodology with students exploring different sources to construct their own knowledge, this lack seems a hindrance. Furthermore, the absence of note taking during lectures coupled with the absence of textbooks is puzzling.

Availability and use of equipment
The project has made considerable investment in lab equipment and ICT (software and hardware) for use in lectures and practical sessions. Observations on lecturers’ use of this show mixed results. Some lecturers are taking full advantage of the new equipment, while others do not, or only in a limited way.

A number of lecturers in the physics departments are now using ICT-based equipment. They use sensor connected to computers to show physical phenomena in lectures. Students do the same in practical sessions. Lecturers make use of applets to introduce concepts to students. In one physics department, video-clips of all new equipment have been produced with instructions for staff and students on their use. With very little or new technical support staff, this appeared to be an excellent system.

On the other hand, some lecturers use remarkably little of the equipment available to enhance lectures and practicals. Where it is used, lab equipment seems used mostly for demonstrations by technicians while students watch. Little hands-on student activity was observed. In such situations, class sets of the equipment presumably remain locked in store. See Box 4 for entries from observations reports.
Box 4: Entries from observation reports on availability and use of equipment.

‘… There were no ICT facilities available, but even the use of coloured chalk would be very helpful in this topic (showing various intervals of solutions).’ (mathematics lecture observation report)

‘… The room is well organized now with two big tables along the walls, but the stools are too high to work properly. The demonstrator uses the OHP with self made transparencies and a copy of the lab manual.’ (biology lab observation report).

‘… On the table there were some Petri dishes with bacteria (hemolytic on a blood agar plate, a nutrient plate and Rhizopus culture on bread). There were some slides and cover slides for the students to make a fresh slide of Rhizopus by themselves. The technician explained to them how to do that.’ (biology lab observation report).

‘… The instructor did (within the circumstances) a good job. But the use of ICT (the topic involved graphing) could enhance the learning. Some students were clearly little interested (repeaters?), an activity for active participation e.g. to discuss an exercise in pairs might improve this.’ (maths for physics lecture observation report).

Technicians training programme
During the summer holidays of 2008, technicians from all public universities in Yemen attended a training programme organised by staff of the physics, chemistry and biology departments at Sana’a University. Originally intended to take place abroad in either Egypt or Jordan, it proved difficult to find a university that could offer such a training course. The organisers were also involved in the development of the new faculty programmes. This initiative shows the ability of staff to take their own initiative to develop new programmes without outside support.

Level 5 – Student learning outcomes
This has not been researched systematically since it is still too early to measure this. Some of the comments in the observations above prompt us to interview students next about what they think they have learned (the experiential curriculum). A next step will be to actually measure student performance (the learned curriculum), but perhaps that is a bridge too far for the time being.
Conclusions and discussion

At the levels 1 and 2 of the Guskey model (participating staff’s reactions and learning) the achievements have been excellent. There is a clear appreciation of what was done and learned in introductory workshops as well as indications of learning taking place as groups of participants worked independently and under the guidance of local staff on the development of standards, new programmes, new courses and new teaching and learning methodology.

There are significant problems with organisational support (level 3) of the curriculum reform during implementation. At best, the administration of the faculties condoned the new programmes, but in some faculties the newly approved programmes where largely ignored. Staff actively involved in the development of the new programmes and courses were withdrawn from teaching these. This has hampered a proper introduction of the new programmes and courses by the faculty administration which at times seemed to actively block teaching of the new courses. Two major areas of concern flow from these observations:

1. Support from the faculties for the programme reform is crucial for the reform to succeed and be sustained. In one case, the support was not evident and has led to delays in implementation
2. Using selected staff from each faculty has unwittingly resulted in an elite group with advantages and perks attached to their positions. The rest of the faculty is reluctant to cooperate with this group.

Without adequate grounding in a faculty, an externally funded project like the MASTERY project has very little leverage to influence the policies of a faculty and is particularly problematic when it comes to implementation of new programmes. The implementation of new teacher education programmes in the three Yemeni universities described in this paper is no exception: such a situation proves to be a major stumbling block.

Where learning clearly took place at levels 1 and 2, this was only applied later to a limiting extent in lectures, group sessions and laboratories (level 4). This is not surprising, as the literature on educational change is full of examples of implementation where things do not go as planned. Support at individual and departmental level by local project management and international consultants have helped the implementation process, but only on a limited scale. One possible explanation for the differences in results in level 1 and 2, and level 4 may be the fact that in levels 1 and 2, participants worked in groups, while they seem on their own when they implement the new courses in the classrooms and laboratories (level 4). Attempts to institute a system of peer collaboration of lecturers have been unsuccessful, apart from a few lecturers who do collaborate

The effectiveness of staff development
Technicians could have played an important role in shaping the practical sessions, especially after the technician training workshops, but in a very hierarchical system there seems little communication between lecturers and technicians.

Student achievement (level 5) has not been measured in a systematical way as part of this review. It was felt that it was too early in the reform process to see any kind of change in achievement.

The analysis may imply that the three universities and faculties are of similar quality and have the same facilities. However, in reality rather large differences exist in facilities, resources and availability of staff. Generally, Sana’a University is much better resourced and has much more and better qualified staff than the other two universities.

This paper explored the effectiveness of staff development at the three universities at the level of the intended curriculum, as well as the level of operational curriculum. This results in two sub-questions:

**How well did the project support staff with the development of teacher standards, new programmes and new courses (intended level)?**

From the observations we conclude that the project has been successful in supporting staff in the development of new programmes and courses. Not only have they been able to develop these programmes, but they have also learned the skills to develop other programmes, such as the technicians training in the summer holidays in 2008.

**How well did the project prepare and support staff for and with the implementation of the new courses (implemented level)?**

From the observations we conclude that the project has been partially successful in supporting lecturers implementing the new courses. Some lecturers have been successful in employing new teaching and learning methodologies in combination with the use of new equipment, in particular ICTs. However, much more support, over longer periods of time, is needed for many other lecturers to successfully implement the new courses.

Indeed, the analysis highlights that ownership issues are fundamental to bring about sustainable change. All too often, projects have little influence on faculty politics and entrenched positions of key staff. There-in lies the challenge for most educational projects.
References


