Abstract
The global trend is for knowledge generation and construction to replace knowledge replication and repetition. Effective learning has moved away from drill-and-practice, rote learning, memorization and repetition styles: now a premium is placed on higher order thinking for creativity, imagination, evaluation and flexibility in order to keep pace with the information age. These changes should simultaneously receive attention in professional teacher development programmes. The two universities involved in science and mathematics teacher development in Ghana have been assisted by a Dutch consortium to take on board these global trends in order to improve their capacity to train more and better-qualified science and mathematics teachers. This chapter describes innovations implemented within the project, aiming at a more student centred teaching approach. Here, particular attention is given to the use of new student textbooks accompanied by the development of course manuals. Our objective is to provide insight into the project set-up, design and use of course manuals, quality assurance of the innovations and challenges faced during the process.

Introduction
Both Higher Education (HE) and Tertiary Education (TE) have major roles as providers of teachers as well as other human resources to almost all levels of the Ghanaian educational system. Their institutions receive the graduates from the Senior High Schools (SHS) and develop them into properly qualified manpower for the nation.

HE institutions’ dual role as providers and at the same time recipients is a delicate cyclic relationship that needs to be nurtured carefully and maintained with eagle-eye vigilance. Science and mathematics teacher development is one of the pillars of this cyclic relationship. Depending on how the relationship is manipulated by various stakeholders, there can be a downward deterioration or upward progress. Over the last two decades, there are strong indications that a downward spiral has developed through deficiencies in science teacher development in the country. The major challenge is to stop and reverse it in the upward direction.
This paper presents one particular initiative aimed at reversing this downward spiral: the Higher Education capacity building project, PRACTICAL. In this project, funded by the Dutch Government, the Department of Science and Mathematics Education (DSME) at the University of Cape Coast (UCC) and the Faculty of Science Education (FoSE), University of Education Winneba (UEW) work together with VU University Amsterdam (VU) to improve their capacity to train more and better qualified senior secondary mathematics and science teachers.

In this paper we will describe lessons learned from the PRACTICAL project by looking specifically at the development and implementation of curriculum support materials as a tool for change in the UEW and UCC undergraduate programmes for science and mathematics teacher-trainees. The aim of this paper is twofold. First, we will inform about the main lessons learned throughout with regard to implementing curriculum support materials. Second, we will provide suggestions for future projects in the same field of expertise.

**Historical Background**

Various reports (e.g. World Bank, 1995; Girdwood, 1999; Akyeampong & Furlong, 2000; Ottevanger et al., 2005) have discussed diverse issues pertaining to African universities and Ghana in particular. Ghana inherited an educational system from its British colonial rule after independence. This was quickly modified by the first government of Ghana and by the early 70s the country could boast of one of the most highly evolved and regarded educational systems in the sub-continent. For example the University of Cape Coast was established as the third public tertiary institution in Ghana. It was set up in October 1962 with a mandate to train professional graduate teachers to teach in the country’s growing number of secondary schools, teacher training colleges, polytechnics and technical institutes. In 1964, UCC was designated specifically as a University College of Science Education but the realization of this in practice was difficult and so when the University gained its full autonomy in 1972 the idea of a university solely devoted to training science educators had fizzled out. Currently UCC has expanded its mandate from an original focus on teacher education and has included an increasing array of other programmes, although about 50% of students are still enrolled in education related programmes.

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1 Programme Reform and Alignment for increasing Competencies of Teachers and for Improving Comprehension and Application in Learning science and mathematics. This project is funded by The Netherlands Programme for the Institutional Strengthening of Post-secondary Education and Training Capacity (NPT) and runs from December 2005 -November 2009.
A general economic malaise in the late 70s and early 80s took its toll on the educational system of the country. It was assistance from the World Bank and other development partners that an economic recovery programme was embarked upon that also led to a 1987 Education Reform Programme. However, this reform programme did not provide much panacea to the HE institutions both old and new. The institutions have gone through very trying times. Most especially the reform brought with it tremendous increase in enrolment without corresponding supply of both material and human resources. By mid 2000s therefore some HE institutions had gone through a long period of resource starvation.

In the reform the duration of pre-university education was cut down from 17 to 12 years and new HE institutions were established including UEW. The UEW was established in the early 1990s through the fusion of a ‘specialist’ and an ‘advanced’ training college at that time. Before its full autonomy in 2004, it had operated as a university college under academic affiliation to UCC. Its initial enrolment was mainly certificated teachers who were upgraded to a diploma level and teacher diplomates who followed a 2-year programme for the award of Bachelor’s degree. Currently SHS graduates comprise about 80% of every fresh intake. About 60% of its enrolled students are prepared by the BEd programme for teaching at SSS level. UEW has separate departments for Mathematics Education and for Science Education: these are responsible for handling both content and methodology courses. In contrast, at UCC the content courses are taken in an allied faculty or department (e.g. biology in the School of Biological Sciences; chemistry in the Department of Chemistry, School of Physical Sciences).

These afore-mentioned basic differences between UCC and UEW notwithstanding, the current BEd programmes at both institutions have a similar set-up. Both programmes are of four years duration and students specialize in one major and one minor teaching subject. In the major and minor subjects students take some of the core courses (usually called ‘content’) in the Schools of Physical and Biological Sciences, usually up to the 4th year. A BEd (science) or BEd (mathematics) student enrols in a range of courses with the following estimated loads over four years (Table 1).
Table 1: Estimated workload of BEd (science) or BEd (maths) students in UCC or UEW

<table>
<thead>
<tr>
<th>Topic</th>
<th>Estimated load</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Studies e.g. Information Retrieval</td>
<td>10%</td>
</tr>
<tr>
<td>Professional Education e.g. Philosophy of Education</td>
<td>25%</td>
</tr>
<tr>
<td>Science Education e.g. Psychological Basis of Science Education</td>
<td>25%</td>
</tr>
<tr>
<td>Pure Science in two subjects such as biology and chemistry</td>
<td>40%</td>
</tr>
</tbody>
</table>

Background and aims of the PRACTICAL project
The overall objective of the project is to ‘improve the quantity and quality of mathematics and science teaching staff at all the levels of the education hierarchy, and improve the know-how and capacity in the education system for improvement of science and mathematics education in Ghana.’ The project emphasizes strengthening the Department of Science and Mathematics Education at UCC and the Faculty of Science Education at UEW to improve their capacity to train more and better-qualified mathematics and science teachers. In 2006, a diagnosis was conducted by two teams of consultants (one national and one Dutch team) to set the compass for the project. That diagnosis included examination of the academic programmes and course documents, interviews with staff and stakeholders, observation of teaching and of On Campus Teaching Practice by students (OCTP).

The diagnosis revealed some pervasive challenges in science teaching and learning in general. The challenges could be associated with three stakeholders of education; namely the state, the student and the teacher:

For the state, the teams found out that the educational tradition in the country places great emphasis on learning the theory that may be leading to cognitive overload. In the whole country, the educational goal rests passionately on passing examinations with good grades which ultimately enables the holders to secure good jobs.

On the side of the student, it was established that only about 50% of the secondary school students pass in the core mathematics and science and a
similar situation prevails in the elective subjects; in spite of the highly selective nature of students into the programmes. It is considered that although the underlying causes for the high rate of failures at the SHS are many, they are particularly connected to the hierarchical nature of learning the subjects and the need for good concept formation at the lower levels to build on further at the higher levels. Qualitatively the knowledge and skills of students coming out of SHS have been consistently reported as weak by various stakeholders and observers. Problems are particularly reported in the reasoning skills of students and their ability to design and conduct practical investigations. Rather than a more practical and problem solving skills as a goal and a more student- centred learning activities as an approach, rote learning of theoretical verbal content becomes almost unavoidable. Teachers face difficulties in teaching science and mathematics in a practical problem solving way. As a consequence of this, most post-secondary institutions offer remedial courses to upgrade the level of competence of potential applicants. The most promising candidates according to the criteria set by the various institutions are selected for the various programmes. A multiplicity of para-remedial institutions (ranging from one man business to partnerships of various forms) have also sprung up purporting to get the failed students out of the entanglements of being stagnant in their pursuit of academic laurels.

The problems with the teachers were traced to two major interacting sets of factors in the teacher development programmes of the two institutions i.e. UCC and UEW. First, those connected to the large groups of trainee teachers which lead to reduced opportunities for interaction between lecturers and individual students. Second, problems connected to the lack of practical orientation in the programmes. The latter scenario is judged more serious considering the fact that the SHS syllabus enumerates a lot of practical activities that the student should engage in. Unfortunately the teacher who has been developed to guide the students in that direction has not been offered the necessary platform to gain confidence in that area. But it has to be pointed out that scientific knowledge is best developed from practical experience perspective; therefore practical work, recording of scientific data and interpretation and application in everyday life should be the centre and focus of school science teaching and learning. Hitherto the lecturer composes synthesized authoritative notes and the student copies the pre-digested information which is dumped back to the lecturer during examination. Learning by the student is just drill and practice. This teacher centred interaction in the teacher development programmes results in low comprehension by trainee teachers who cannot apply their knowledge in practical situations.
Based on the diagnosis, it is the considered position of the PRACTICAL project that the level of mastery of subject content and a more practical orientation are crucial steps towards the development of a skilful science and mathematics teacher trained at any of both institutions. Therefore, a consistent emphasis on active learning of science and mathematics by the teacher-trainee is a must.

Although some of the issues raised were beyond the scope of PRACTICAL the following were found to need immediate redress:

1. The main instructional method used was teacher centred exposition which is characterized by silent students who copy copious notes which they struggle over to understand later. Teachers therefore seem to be doing the science for the students and not the students doing the science themselves.
2. Teaching styles have failed to take into consideration the different learning styles of students.
3. The connection across the various courses was hard to find. It appeared the courses had been assembled for their own sakes and did not form a coherent whole.
4. It was difficult finding the alignment of the objectives of the courses with the assessment at the end of a session.

In the light of all that, and taking into consideration current educational theory on teaching and learning (Davies, 1995; Cohen et al., 2006) the project consultants recommended that there should be:

1. A careful selection of content and practical activities to address gaps in students’ understanding and skills and to lay a good foundation for future teachers;
2. A systematic development of study behaviour through reading skills to create life-long independent learners and promote scientific reasoning behaviour;
3. Clear learning goals and assessment practices to stimulate intended learning and development of students;
4. Opportunities for students to go beyond minimum learning requirements and development of curiosity, interest and enquiring mind;
5. Provision of many experiences essential for learning especially freedom to discuss and debate scientific concepts in a challenging but non-threatening environment and develop the capacity for training to work in a team. It is not all concepts that should be given to students as solid facts; but some concepts should be developed through debate, discussion and consensus building.
From recommendations to interventions

The recommendations described in the previous paragraph led to revision and modernisation of the curricula at both institutions, emphasising active learning in all courses. To a certain extent this emphasis was already in place at some departments. However, facilities (student textbooks, course manuals, resource books and laboratory equipment) and expertise on how to put it into practice were often lacking.

The use of textbooks and course manuals was indicated as a necessary condition for improved student learning in the large teaching groups with which lecturers are faced. Therefore, the proposed innovations towards a more student centred teaching approach were supported by the introduction of new student textbooks accompanied by course manuals. These course manuals systematically describe learning objectives, teaching plan, learning activities and assessment and are linked to the student textbooks. Furthermore, the shift from teacher centred towards a student centred approach in teaching and learning was supported by staff training on new pedagogy, interactive student activities and use of ICT. Although staff training was a major part of the project, it is not the focus in this paper. A list of all interventions and activities contributing to the use of student textbooks and course manuals is presented in Annex 2.

Prior to the innovations proposed by the PRACTICAL project, very little curriculum support materials were in place at both institutions. A major part of the project was the selection, ordering and distribution of books for all undergraduate courses. Between November 2006 and June 2009 the project team and Ghanaian staff members together selected over 300 different titles to be used as student textbooks and reference books. More than 2300 copies in total were ordered and distributed to the libraries of UCC and UEW.

After the selection of the student textbooks, a course manual format was introduced to the academic staff and a plan was made on development and implementation. The course manual was introduced as curriculum support material, to be used parallel to the selected textbooks and to be developed by academic staff themselves to support independent student learning. The chosen course manual format supports independent learning in the following ways:

- It is a document describing the way students have to follow in order to master the subject content of the course.
- It is an informative document in the sense that it explains the objectives and organization of the course.

2 An example of a course manual format is presented in Annex 1.
• It can have an instructive character, for example by giving explanations and clarifications of the subject matter and by providing the necessary study instructions.
• It helps students to work more independently and is a motivator for students.
• It is a strong communication tool between teachers and students, also in situations where the teacher is not present.
• As a guiding and organizing tool it provides structure to students and teachers before, during and after lectures.
• Using course manuals improves transparency in terms of what is expected from students by teachers, and vice versa: what is expected by students from their lecturers.

It was agreed from the beginning that course manuals do not replace study books, syllabi or research articles but are used parallel to them. Course manuals have a model function especially at the beginning of a study programme. By using a course manual students can be guided in studying content and performing assignments. By doing so they will gain insight into the effects of studying and the different learning goals. Course manuals for classes at a higher level will contain less information on study skills, because students at higher levels are required to be more independent.

Since the use of course manuals was a new approach for most academic staff in Ghana, they were trained and supported in the development and use of them. A feedback system was set up in which the developed course manuals were assessed by Dutch counterparts by distance. With effect from 2009, course manual development continues with its own momentum and conducted by Ghanaian facilitators without external expertise.

**Measuring Quality of the proposed innovations**

Once the academic staff started developing and using student textbooks and course manuals in their courses, Quality Assurance Committees were set up at departmental level in order to assure the quality of the innovations. A formative evaluation approach was used. In order to make the concept of quality assurance measurable, the following three criteria for quality were used, with each a different emphasis in the process: from validity, to practicality, to effectiveness (Nieveen, 1997). Thus the QA Committee collected information about the validity of a course manual (state of the art knowledge; coherence between content, pedagogy and assessment), and its practicality (asking questions such as “could it be used in practice by lecturers and students?”). These three aspects are discussed in more detail in what follows.
Validity
The validity phase is concerned with the question whether the newly introduced course manuals are sufficiently connecting content, pedagogy, and assessment in a coherent way, and conform to the agreed format. QA committees critically examined developed course manuals by using a monitoring instrument. They assessed whether the following aspects were sufficiently incorporated in the documents (Table 2).

Table 2: Aspects of validity of a course manual

<table>
<thead>
<tr>
<th>A valid course manual should:</th>
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<tbody>
<tr>
<td>1. Provide basic conditional information</td>
</tr>
<tr>
<td>2. Provide guidance and orientation on learning</td>
</tr>
<tr>
<td>3. Be motivating students</td>
</tr>
<tr>
<td>4. Be adapted to the starting level of the students</td>
</tr>
<tr>
<td>5. Contain learning objectives</td>
</tr>
<tr>
<td>6. Attaining the learning objectives</td>
</tr>
<tr>
<td>7. Facilitate the attainment of the learning objectives</td>
</tr>
<tr>
<td>8. Contain examples for practising and assignments</td>
</tr>
<tr>
<td>9. Show how the assessment of the learning objectives will be done</td>
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</tbody>
</table>

Practicality
Practicality is concerned with the usability of the support materials. Practicality of the curriculum was assessed in the next phase in the development process which involves the usage of the course manuals, books, and other teaching and learning materials i.e. the overlap of all the curriculum support materials. In other words, can lecturers and students use the course manuals and textbooks and equipment in the classroom without any problems? This was measured by using student and lecturer surveys, as well as observations and post-lecture discussions. To date about 10 students from each of 6 courses have been sampled for the exercise.

Effectiveness
The final phase of the quality assurance process focuses on effectiveness; do course manuals lead to desired innovations and to better student achievement? This phase still has to be assessed during the remainder of the project. To date all the surveys carried out indicate that the intervention is good. Lecturers acknowledge that they are being helped to see teaching and learning in its proper perspective. Gradually it is being understood by the student-teacher that knowledge and understanding are constructed and acquired for ownership by learners themselves and not only through lecturing or explanations.
Results
Textbooks and course manuals are now accepted curriculum support materials at both UCC and UEW. However, as in all educational reform, the implementation process has been a challenging one and is still not completed. In the following paragraphs we will describe the preliminary results along the lines of the validity, practicality and effectiveness trinity, based on project reports, monitoring visits, staff interviews and student surveys.

Validity
There is a procedure agreed within the project by which the preparation of a course manual may be deemed complete. Included in the steps are about 2 stages of review by a specialist Dutch counterpart. After a review by a Dutch counterpart any necessary amendments are done by the course lecturer. Although it was initially agreed that course manual be developed for only level 100 and 200 (year 1 and year 2) courses, most lecturers have found the use of the intervention relevant in all the courses they are teaching. To date a lot of the course manuals are at various stages of preparation although they are usable for instruction.

Over 75 course manuals were submitted to the Dutch consultants for the first review. Both face-to-face and e-mail were used to provide responses to the Ghanaian lecturers. The feedback and comments from the Dutch consultants were analyzed systematically and give a clear picture on the quality of the first course manuals that were produced. The outcome of this analysis is presented below in nine categories of feedback, in line with the nine categories of the validity phase (see Table 2).

1. Basic conditional information
The course manual basics, such as course title, code, credits, name of lecturer, course schedule, reference or literature list, etc. were all well presented in the first versions of the course manuals.

2. Guidance and orientation on learning
How are the course set up and learning activities explained in the course manual so that students know and what is expected from them up front? It was recommended that the produced course manuals should describe more precisely what students are expected to do and be more transparent and open about the course set up. It was suggested that some course manuals are unclear about what exactly is expected from students and that more information is required on reading instructions, assignments, the purpose and objective of assignments and indication of the student work load.
3. Motivating students
Course manuals can motivate students by explaining the importance and function of the course and the place of the course specifically within the curriculum and even in life generally. This category also includes text readability, lay-out and editing; by making the course manual readable and accessible it will be fairly easy for students to follow instructions and advise.

Here, we see similarities with the previous category (guidance and orientation on learning); more transparency and provision of information towards students was necessary according to the feedback. Various suggestions were made by the Dutch consultants to explain the function of the course and connection with other courses in more detail, especially when courses have a theoretical and practical part. Other suggestions from the Dutch consultants to make lectures ‘less boring’ are the use of photos, ICT and more exciting experiments. These suggestions were followed by several trainings on the use of ICT and interactive practicals in the laboratories. In addition, quite some remarks about readability, lay-out and editing were made, especially the suggestions to use an active tense (rather than passive) and directly addressing the students in the text.

4. Connecting to the starting level of the students
Most of the course manuals provided clear descriptions on required prior knowledge, skills and attitudes for the course. Some lacked connection with concepts that were introduced in previous courses/lectures.

5. Learning objectives
According to the agreed format, each course manual should include clearly formulated learning objectives or competencies. The majority of the learning objectives in the course manuals that were analysed needed more focus and were not formulated in an operational way which makes them difficult to assess. Furthermore, the learning objectives for practical skills and student behaviour (attitude) were quite often absent in the course manuals.

6. Attaining the learning objectives and
7. Facilitating the attainment of the learning objectives.
Does the subject content for each topic support the attainment of the learning goals? Is the sequencing of knowledge, skills and attitudes presented in a logical order? Is the use of the prescribed textbook clear?

Most of the feedback given by the Dutch consultants was within these two categories, the remarks being quite diverse. The main comments have to do with the amount of (home) work that is expected from the students, this was in
many cases too much considering the amount of time available for the lectures. Lecturers were advised to cut down on the amount of topics or shift difficult topics to other courses. Other suggestions in this category included; use different or more appropriate lab experiments, change the sequence of topics addressed, use of more introductory and revision lectures, use of rubrics, availability of lab equipment and references to textbooks.

8. Practicing and assignments.
Course manuals may include (references to) assignments, practice problems and questions about the content matter. These should be sufficiently challenging and logically built up in complexity and difficulty.

Here we see the same topics arising that were addressed in the previous categories; more information and guidance towards the students on assignments is necessary, including provision of more information on the expected work load. In addition, it was also suggested that assignments were to be made more interactive and to ask students to do more at home preparation for the lectures.

9. Assessment of the learning objectives;
This final category entails the description of test procedures such as assessment method, scheduling, transparency, conditions, etc. Not many suggestions for improvement were made in this category, other than the suggestion to make it more explicit to the students how they are going to be assessed.

Although individual differences occur in the feedback from Dutch consultants, the suggestions had usually to do with coherence among the curriculum, instructional design and assessment. Once feedback was received from Dutch counterpart, the lecturers incorporated the amendments where necessary. Certain suggestions were, of course, not readily available; in those cases the lecturer suspended the incorporation of that particular amendment.

Practicality
After the first round of feedback on the course manuals amendments were made and lecturers introduced the course manuals in their courses. At both institutions, the first steps to use the course manuals were challenging for the departments, staff and students, as described in the following paragraphs.

Departmental organisation
The implementation of the innovations at both institutions did not happen at the same pace in all departments. This was mainly caused by the differences in programme structure and the way the departments organised the distribution of
student textbooks through their libraries.

One of the obstacles in preparation of the course manuals was the unclearness about who teaches which course until the very last moment. This made it difficult for staff to develop a course manual for their courses in time. Another complicating factor when introducing the student centered activities were the large class sizes. Support services such as photocopiers were provided by the Departments and NUFFIC secretariat to distribute the course manuals to the students, ideally before the first lecture.

Staff motivation
During the implementation of the innovations it became apparent that there was a need for continued support for implementation of the new programmes from within the department. As in all educational reforms, there are early adopters and frontrunners on the one hand while others are more hesitant in their approach. Intrinsic motivation for trying out new teaching approaches and using and developing curriculum support materials turned out to be the key to success.

One major obstacle that became visible is the high work load for academic staff combined with a salary system in which payment is based on additional duties upon authentication by the head of department. Developing course manuals is very time consuming and is often not regarded as part of a teaching task, but as an extra job for which incentives are expected. For staff who are intrinsically motivated to implement the innovations, lack of time is a major concern.

Supporting facilities
The new direction is based on the assumption that sufficient textbooks, practical equipment and ICT based teaching and learning are in place. In reality, this was difficult to realize. Absence of necessary textbooks led to delays in development of course manuals especially for methods courses. Furthermore, a major lack of adequate student facilities such as lecture halls, study rooms, library and computers have worked counterproductive.

Student’s conceptions of learning
During the implementation, lecturers worried about students’ negative attitude towards the innovations. Staff indicated that students are not used to “read and prepare” assignments before coming to class and are very reluctant in making homework or doing pre-class preparations such as reading. In addition to this, the general impression at both institutions is that students prefer the ‘old style approach’ where they copy notes from the teacher during lectures. This approach fits well within the approach that students were already used to in primary and
secondary education. Changing their learning behaviour and mind set is likely to take time and forms a big challenge.

In addition, the high workload of students makes them unable to come prepared to class. However, it is the experience of some lecturers that students are appreciative of the new approach to teaching and learning in the university. They admit that it is hard work on their part but eventually they realize that they come to own the knowledge.

Development and use
At UCC a student survey was carried out in December 2008 to investigate the use of course manuals. Seventeen students filled out a questionnaire; the outcome revealed that not many students took their course manual to the lectures. This could be viewed more of transition problem than habitual. Hitherto students have been used to carrying their exercise books to take down lecture notes. However by the end the academic year in June 2009 a similar survey revealed that most students carried their course manuals along to lectures especially in the course where the instructors often referred to the course manual. The institutions carried out a survey in April-May amongst sixteen lecturers. The outcomes indicated that there is a general improvement in the number of students who take their course manuals to the lectures. Lecturers are therefore finding it easier to make references to course manuals during lectures. There has also been a tremendous improvement in the reading of the recommended portions of textbooks before and after lectures. Lecturer-student interaction has therefore become more fruitful.

All the students sampled pointed out that the use of course manuals for teaching was very useful and therefore the practice should continue. It was however suggested that dates for quizzes/ assignment/term essays which would form part of the overall assessment were to be negotiated between the students and lecturers concerned. It was also suggested that a beefy course manual appeared rather intimidating and therefore about a maximum of twelve pages should prove attractive in all respects.

In UCC some education students complained about the load of work compared to their counterparts doing BSc. The BSc group take all their courses in the School of Biological or Physical Sciences and end up with a speciality in science e.g. fisheries and aquatic sciences, molecular biology and biotechnology or water and sanitation. The problem was exacerbated by comparatively more difficult tests and quizzes for the BEd students. However, the education students confessed that they found the end of semester examination questions easier.
About six UCC lecturers out of about sixteen have indicated that the course manual shifts much of the load now to students and therefore they see themselves more as facilitators of learning rather than transmitters of knowledge. The situation is about the same in UEW. Most lecturers in physics and chemistry found it prudent to do their courses by course manual irrespective of whether the students are from the education department or not. One provision that may remove all student excuses would be the acquisition of all the textbooks by each student.

**Effectiveness**
No data have been collected in this area yet.

**Conclusions**
- Course manuals in various stages of preparation are now being used by students and lecturers to organise and prepare for instructional sessions.
- In most cases the use of the course manuals and textbooks is considered as a huge step forward by both lecturers and students.
- The system of review of the course manual by external counterparts has resulted in adequate course manuals.
- Emphasis has been placed on the structure, content and consistency of such manuals on the basis of professional criteria (‘validity’) and their usability during first time implementation (‘practicality’). With respect to improved student learning, no analysis of examinations results has yet been done.
- It is most encouraging that the course development efforts have sparked interest outside the group of staff and outside the departments currently involved.
- The changes made are a first step towards a more student-centered learning approach.

**References**


ANNEX I: Course Manual Format

Practical details of the Course
Title:
Code:
Credits:
Prerequisites (courses):

Instructor(s) information
Name:
Role:
Office and office hours:
Tel: Email:

Introduction: to motivate students for this course, the subject content of the course is introduced and accounted for. The introduction could present some questions or problems which students should be able to answer or solve at the end of the course. Furthermore, the purpose of the course is explained by using examples. A short description of the relation between the different elements in the course and the relation with the rest of the curriculum and the professional field is desirable.

Learning objectives: overview of the knowledge and skills that students have gained at the end of the course and how the student should demonstrate that he or she masters the right knowledge and skills.

Literature and materials: list of compulsory and optional supplementary reading(s), including required materials for field work or practicals.

Type of course: practical in laboratories, lecture, group work. Course policies might be included here, such as: rules for attendance, late/missing work, illness, make-up, and cheating/plagiarism.

Course schedule: overview of classes per week, and what students need to read and prepare for each class. Including: student workload (hrs/week) for lectures, practicals, group work and self-study hours.

Assignments: list of assignments, practical sessions, field work, including rules of conduct.


3 This is an example format. Course Manuals developed within the PRACTICAL project vary in form and structure and contain between 5 and 15 pages per document.
**ANNEX 2: Interventions and activities supporting the use of books and Course manuals**

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>May/June 2006</td>
<td>Workshop in the Netherlands</td>
<td>Orientation on the choice of possible textbooks and resource books for UEW and UCC lecturers.</td>
</tr>
<tr>
<td>November 2006</td>
<td>Workshop in Ghana</td>
<td>Final choice of textbooks and resource books for UEW and UCC lecturers.</td>
</tr>
<tr>
<td>January 2007</td>
<td>Workshop in Ghana</td>
<td>Introduction to the use and development of course manuals for UEW and UCC staff by 2 Dutch consultants.</td>
</tr>
<tr>
<td>May 2007</td>
<td>Workshop in Ghana</td>
<td>Revision and further development of course manuals in methods courses. Part of a broader workshop on practical and active methodology by 4 Dutch consultants.</td>
</tr>
<tr>
<td>October 2007</td>
<td>Monitoring visit</td>
<td>To monitor the implementation of innovation in the undergraduate courses to assess early implementation challenges and experiences by 2 Dutch consultants.</td>
</tr>
<tr>
<td>December 2007</td>
<td>Workshop in Ghana</td>
<td>Review of existing course manuals for all first semester content courses and development for second semester courses. Part of a broader workshop on content courses by 3 Dutch consultants.</td>
</tr>
<tr>
<td>December 2007</td>
<td>Stakeholders workshop</td>
<td>Setting up a QA system for course development, including course manuals. Decisions made on QA process at project management level. Installation of QA committees for each department. Part of a broader workshop.</td>
</tr>
<tr>
<td>January 2008</td>
<td>Workshop in Ghana</td>
<td>Further development of course manuals for methods courses as part of a broader workshop on teaching methodology by 2 Dutch consultants.</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Description</td>
</tr>
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<tr>
<td>March 2008</td>
<td>Peer coaching visit</td>
<td>To support staff of methods courses in implementing new courses and course manuals by using class-room observation. Peer coaching was conducted by 2 Dutch consultants.</td>
</tr>
<tr>
<td>March 2008</td>
<td>QA committee meetings</td>
<td>Agree with departments and project managers on content and process of quality assurance system for course manual development. Preparation of full overview and monitoring instrument of all course manual development activities.</td>
</tr>
<tr>
<td>May 2008</td>
<td>Retreat in Mankessim Ghana</td>
<td>Evaluation against the evolved quality assurance system of all course manuals prepared to date.</td>
</tr>
<tr>
<td>June 2008</td>
<td>Workshop in Ghana</td>
<td>QA coordinators discussed and agreed upon the new QA instruments for lecturer and students. Further development of content course manuals.</td>
</tr>
<tr>
<td>June 2008</td>
<td>Workshop in Ghana</td>
<td>Development of course manuals conducted by a team of 2 Dutch and 4 Ghanaian consultants. A new group of lecturers was invited to this workshop.</td>
</tr>
<tr>
<td>December 2008</td>
<td>Retreat in Mankessim</td>
<td>Workshop for DSME, UCC lecturers, conducted by Ghanaian consultants. To equip all lecturers in DSME with the rudiments of preparing course manual.</td>
</tr>
<tr>
<td>October 2009</td>
<td>Committee meetings in UCC and UEW</td>
<td>To monitor the implementation of innovation in the undergraduate content and methodology courses to assess early implementation challenges and experiences by 4 Dutch consultants</td>
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</tbody>
</table>