

# Writing, Chemistry and the Four Skills: Trends and Directions

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## Abstract

This study recounts the process undertaken to produce English language teaching materials for chemistry majors at Udon Thani Rajabhat University. Initially, a writing course was requested for third year students for one semester and later the Language Center decided to produce an integrated skills course focussing on listening, speaking, reading and writing for possible future use. Last semester, the third year chemistry students attended a second course; as a consequence, this presented the Language Center with the possibility of trialling various sections of the new integrated skills course. This semester the new course participants are participating in the final pilot course which has been extended by a further sixteen hours.

## Introduction

The students attending this course are chemistry majors and the Language Center at Udon Thani Rajabhat University was initially tasked with designing a writing course consisting of sixteen weeks of instruction of two hours per week, totalling thirty two hours. After two of these courses were completed, the Science faculty who are responsible for the students, requested that the course be extended by a further sixteen hours and that it was to incorporate the four skills.

Graham (2007) detailed the initial systems, frameworks and components that made up the first writing course and gave insight to what might be expected during the piloting of the expected courses. This is the second of what will inevitably be a trilogy of papers describing the processes undertaken to prepare an integrated skills English language course for chemistry students.

What is important to emphasise at this juncture, is the fact that the aim of the course, as detailed in the previous paper, is to teach English and not chemistry and must not be confused with education approaches such as Content and Language Integrated Learning (CLIL), namely the teaching of content and the simultaneous learning of a foreign language (Roldan Tapia 2007). In truth, as the pilot courses have progressed, the students have been taught English by the teacher and the teacher has been taught chemistry by the students, in English.

The third paper is expected to contain qualitative research as to the student perception of the courses provided in line with McGinity (1993) as education is a social not natural phenomenon and takes into account perspective, intention and context.

Students are predominantly female (approx. 80%) probably as a direct consequence of action taken more than 25 years ago to entice girls at secondary school in Thailand to choose science (Fensham 1986). Before this, boys had continually outperformed girls with the exception of a study conducted by Klainin (1984).

Whilst English for Specific Purposes (ESP) suggests that it would be prudent to master the general symbols, sounds and grammar of English first (Orr 2001), it is not possible in

this case due to the nature of the Thai education system and its history of teacher centred rote learning that has stifled the creativity of Thai students over the years. This makes the goal of students being autonomous readers in their field according to innovations like the REST Project (Hudson 1991) impossible at this time; however, the introduction of student centred learning in accordance with Thailand's Education Act of 1999, will hopefully resolve this problem in the future if it is implemented correctly and in a timely manner.

In addition, the use of the communicative approach has been widely adopted throughout the world; however, it needs to be used sparingly with a more eclectic attitude towards teaching as indicated by a reflective study by Kajornboon (2000). Ellis (1996) warns that the communicative approach is not for everyone and that, "an integration of Eastern and Western teaching practices can be jointly explored."

### **Background to ESP and this study**

There are many commentators in the industry who have produced books and papers that explain the background of ESP. Gatehouse (2001) details absolute and variable characteristics of ESP whilst giving an overview of the views of Hutchinson and Waters (1987), highlighting the ESP tree. Richards (2001) gives a brief history of ESP and cites Strevens (1977) as well as Richterich and Chanceril (1978) whilst explaining the importance of the needs analysis in ESP. Graves was an inspiration for the initial writing course as her Framework of Course Development Processes (Graves 1996a) was used extensively in conjunction with the Systems Approach to Training (Graham 2007) and Johnson's Process of Course Development for the Teacher (Graves 1996b). No study would be complete without mention of task-based syllabus design and Long and Crookes (1992); however, it is important that whilst research into prudent practices and pedagogy is paramount in the planning stages, as the piloting of courses have proved, an eclectic approach is needed to galvanise the project to ensure success.

As mentioned previously, Thailand's Education Act of 1999 instructed the education fraternity to adopt a "learner-centred" approach to teaching, moving away from the less communicative "teacher-centred" approach. In preparation for the courses provided, the outline of, "A Learning Centred Approach to ESP" was adopted from Hutchinson and Waters (1987) as it had been previously used in other ESP contexts and had proved successful. In addition, a course developed with communicative goals and goals becoming objectives as detailed by Dubin and Olshtain (1986) was implemented as this too has been recognised by academics as sound practice. It is interesting to note that whilst these books are twenty years old, they still hold up to scrutiny today and at the time of writing this paper, have not been revised.

Countries such as Ukraine have conducted national ESP studies (Ministry of Education and Science 2003) and produced an ESP National Curriculum for Universities in conjunction with the British Council (Ministry of Education and Science 2005) to prepare for European integration, something that other countries may wish to consider.

ESP has countless components and combinations that evolve over time to fulfil the needs within a wide range of social, academic and work related contexts (Orr 2001). Orr (2002) states that ESP has three specific referents in the world of English language education in that:

1. It has specific subsets of the English language that are required to carry out specific tasks for specific purposes.
2. It is a branch of language education that studies and teaches subsets of English to assist learners in successfully carrying out specific tasks for specific purposes.
3. It is a movement that has popularised the ESP profession and its work with ESP discourse.

Johns and Dudley-Evans (1991) emphasise the careful research and design of pedagogical materials and activities within a specific learning context concentrating on needs assessment and discourse analysis of the students concerned. ESP in this context is truly international in scope and can be exemplified by the job opportunities offered to past students from this faculty.

### **The move from one to four skills**

Richards (2001) states the development of syllabus design can be organised into skill based, functional and task based syllabuses and like Herunramdej and Chinokul (2006) an integrated syllabus was considered the best option as an eclectic approach to language teaching will use the best possible methods to ensure the maximum results.

Due to the time constraints of a course that is three hours a week for sixteen weeks (48 hours in total), not all sub-skills of the four skills can be covered to an acceptable degree so the use of research in the classroom and in the field was used to decide what sub-skills would be paramount. There are barriers to effective learning in the classroom (Finch 2002) which need to be addressed so that effective learning takes place. Some students have been labelled failures in the past where English is concerned and need to be motivated to succeed.

An activity based genre approach to teaching writing to students with learning disabilities was an approach considered for adoption as it was compared to teaching low proficiency students in a study by Firkins et al. (2007) and proved useful when deconstructing texts and then reconstructing them in class. A study by Chinnawongs (2002) confirms the Language Center's belief that combining the product and process approaches to writing gives the students the best opportunity to generate and organise their own ideas. Feedback for writing tasks has continued on an individual basis in both written and oral forms.

The SWELL method (Teo 2007) has confirmed that the group work strategy in planning and editing students writing has a sound base for success and is by far the strongest component of the course at this time.

An essay style assignment focussing on language, organisation and content in line with accepted humanities tertiary education practise (Watson Todd et al. 2007) had been successfully completed by the pilot writing course students and was the basis of the new integrated course (Blanchard and Root 2003), as this would lead into the presentation and speaking phase later. A very simple experiment was chosen as the topic as this would give the students the opportunity to explain the experiments they had completed in their previous chemistry coursework, giving them the context they needed to succeed. A model was given to the students for the presentation and then the process was explained of how to attain that final product.

It was important to find a middle ground between over correcting and under correcting students' work (Green 1998) as it was important to help the students grow and to keep improving. Cowie (2001) states that writing feedback has three main benefits:

1. It validates student work and effort by showing that their teacher cares about and is interested in their writing.
2. It helps a few students rewrite their past work by giving text-specific advice.
3. It can motivate other students for their next piece of work.

This feedback is useful for all skills, not just for writing and over the duration of the pilot courses, it has proven very effective in motivating the students to produce their best work. There seems to be substantial published research on the feedback of writing, possibly

more than the other three skills; however, there are many areas of similarity that can be deemed from studies by Pathak and Keng (2001), Chinnawongs (2001) Nassaji (2007) and Padgate (2001) relevant to the students in our classrooms.

The presentation that students have to complete at least twice, so as to see their improvement and provide further motivation due to their success (Yule 1996), is to help with the perceived embarrassment of losing face by making mistakes, something that even professional Thais admit to (May 2007). Students were further encouraged by allowing them to grade their peers, which worked extremely well (Milanic 2007).

Students need confidence in speaking and this can be done by having a class-centred classroom (Senior 2006) by helping students to achieve a positive attitude to themselves and others in the class and creating a positive atmosphere which will motivate the students to achieve (Songsiri 2007).

With regard to reading skills, some would argue that it is the most important skill in ESP due to its primary importance in many EFL environments (Johns and Dudley-Evans 1991), so real training in skimming and scanning was considered vital for the study purposes of the students, which in effect, gives them their context for studying reading in the classroom. Metacognitive strategy training will give meaning to their reading transforming a student's declarative knowledge of reading strategies into procedural knowledge (Dhieb-Henia 2006). Soranastaporn (2002) confirms this with a study highlighting skimming, scanning, the use of background knowledge and guessing meaning from context. Planning, monitoring and checking the learning process are needed in addition to normal reading sub-skills and were implemented into the pilot courses.

Research into learning strategies of high and low language learning achievers (Lerdpaisalwong and Gajasen 2006) gives insight as to ways to bring out the best in our students. If we understand their learning strategies and help them with their quest for knowledge, they will be motivated to use the materials provided and take control and responsibility for their own learning.

### **Trialling of materials**

The materials used were as authentic as possible (Hudson 1991) and whilst it was not possible to have everything tailor made (Orr 2001), every effort was made to show the context of the tasks to be completed and how it related to the students themselves. Baumgardner and Kennedy (1991) demonstrated the use of materials in a local context and this was achieved by looking at the experiments that have already been conducted by the students in their chemistry classes. This in conjunction with problem solving activities (Souillard and Kerr 1990) had a positive effect when trialled in the pilot courses.

The reading of research articles would be considered by most academics as one of the most important aspects of a course such as this; however, the level of English of the articles has proved too advanced and so materials from other sources were used as they were of a more suitable level for the students. Placement test scores over a period of nearly five years have shown students to be either false beginners or at best elementary level learners, so materials had to be at a level that would be both challenging and attainable.

This is not a criticism of the students who have repeatedly served as examples of responsibility and diligence; it is more a criticism of a system that allows students to progress for ten years in their English language studies without effectively evaluating the specific concerns of students, parents, teachers, schools and local/national business. A programme based review of English language education would reinforce the strengths and overcome the weaknesses, thus satisfying the "powers that be (Mackay 1994)."

Basic Reading Power (Mikulecky and Jeffries 1997) contained enough material for initial skimming and scanning, as well as understanding and building sentences and paragraphs. In addition, more specific science based materials were taken from Cause & Effect (Ackert 1999a), Facts & Figures (Ackert 1999b) and Thoughts & Notions (Lee and Bushby 2000), with a view to using the test booklets for assessment purposes.

The lessons followed guidelines emphasised by Professor Carol McGuinness (Nimkannon 2007), consisting of four elements:

1. Learning objectives.
2. Thinking activities.
3. Reflection or evaluation.
4. Making connections of what they have just learned.

The materials were chosen with a view to students being encouraged to ask questions. This is a problem for many Thai students; however, the students in this study, by the nature of them being science students, are willing to experiment with new ideas and the concept of asking questions proved to be easy for them to assimilate. This is in stark contrast to other majors at the university where the asking of questions is still considered a foreign concept. Providing a model or framework in context (Abbott 1980) encouraged the learners to ask questions out of curiosity rather than for compliance to a teachers' request.

The idea to try materials that advertise, "thinking skills" proved popular with the students as they had to solve problems, make decisions and search for meaning by comparing and contrasting in addition to finding similarities and differences in line with views expressed by Professor Carol McGuinness (Nimkannon 2007). She explains that students can be provoked to think by using vocabulary like solve, sort it out, estimate, make a plan etc. ideal for scientific thinking. Basic Reading Power (Mikulecky and Jeffries 1997) contained thinking exercises and although some academics may consider it inappropriate to force students to think in their L2, pilot courses proved that students were more than happy to experiment with the questions asked as long as there was not a penalty for an incorrect answer.

Listening materials were initially a problem; however, after experimentation during the pilot courses, it was decided to use listen texts from the reading books on subjects related to what the students had completed previously. Reading comprehension questions to practice skimming, scanning and context were used for listening purposes. This involved the students having to practice using the same listening and reading text to scaffold at the beginning and then when the students became more confident, they were weaned off the reading text to use just the listening text.

There was a grammar element to the course which consisted of exercises from Recycling Elementary English (West 2002) and this consisted of exercises to combat problems in writing highlighted in a study by Lush (2002), which also had external validity when dealing with general English language errors. A small research project conducted on two Bachelor of Education classes with English majors confirmed that the areas indicated in Lush's research were relevant to the students at Udon Thani Rajabhat University.

Finally, there was further development of science based materials using Basic English for Science (Donovan 1978) which is a specific book to teach English for science. There was not enough time in the course to complete many tasks from this book; however, during the pilot courses for the initial writing course, many exercises were completed successfully, though the students did find the exercises difficult.

## Discussion

At present, this course is taught by a native speaker of English; however, it is the intention of the Language Center that all courses should be taught by Thai teachers of English to expose the teachers to different teaching strategies making them more fulfilled and confident in what they do. Culture is not a barrier (Sowden 2007) and whilst the debate continues over the merits of native speaker versus non-native speaker, it is the authors opinion that a Thai teacher of English has many aspects to their teaching which gives them empathy with the students concerning the problems in learning the English language, after all, they were themselves once in a similar situation in having to learn the same foreign language.

This coupled with the ability to speak in Thai to overcome problems in the classroom gives Thai teachers an advantage as long as they feel confident in what they are doing. An element of scaffolding is necessary until the teacher concerned feels that they can complete the teaching on their own. Teachers can expand their roles in the classroom to be that of cognitive and effective physician (Finch 2002) diagnosing and healing learning and social ailments whilst using their knowledge of Second Language Acquisition (SLA) to take into account neurological, cognitive, affective and linguistic factors in conjunction with their own theories (de Kleine 2007).

It was Block (2003) cited by Dowling (2005) that described Gass's model of SLA process:

1. Apperceived input.
2. Comprehended input.
3. Intake.
4. Integrate.
5. Output.

The output is not just the end product; it is fed back into the system as part of the process again. Reflective practice by Thai teachers of English of how they learned the English language and also the way their students learn will be beneficial to all concerned.

Dobson (2006) explains that teachers are expected to have proficiency in teaching which involves having or knowing how to get teaching-learning activities and that these activities should be controlled by the course objectives rather than the other way round.

Assessment was conducted to show student mastery of that which was actually taught (Orr 2001). Assessment has to be "generally specific" in nature and although not intended to test subject knowledge or text content knowledge, was from a familiar area (Alderson 1988). Assessment was therefore a written experiment, a presentation of an experiment, demonstration of reading and listening skills (skimming, scanning and context) using tests from the course books used on the course. Listening was slightly different as listening texts were taken from the books and reading comprehension questions used. This proved a very effective way to test the listening skills and keep the subject matter relevant.

The latest trend seems to be a Constructivism approach to teaching, expounded at many conferences over the last year. More research is needed to confirm how important student-teacher interaction is in regard to science and the teaching of English.

The Faculty of Science has now requested training for the Bachelor of Education programme, so there is now the need to produce a course for science teachers which opens up opportunities to have students explaining in English how to conduct experiments as if they were teaching in a classroom. The use of simple experiments like, "Rock and

Roll Crystals” made by John Adams Trading Co. Ltd. are now being trialled with a view to being adopted in the new teachers’ course.

Kimball (1996) states, “Language instruction that foregrounds students’ needs points to meaningful practice and meaning making skills for learners to assume responsibility for their own discovery and fulfilment.” The needs of the students as well as the faculty need to be satisfied for courses to succeed as in the business world that has enveloped education, the question that is always asked is, “Who is the final customer?” Tubtintong (1996) informs us that the needs analysis continues to play a pivotal role in providing insights into language learning as objectives and goals of stakeholders vary with changing socio-economic conditions.

For a paper such as this to have any impact on the classroom, the teachers involved in delivering the courses need to be convinced with the findings which resonate with their professional experience and can translate them into practical activities and strategies for classroom use, to be widely disseminated through respected professional networks (Ratcliffe et al. 2004). Students need to be encouraged to be active, co-operative and autonomous learners (Rogers and Mulyana 1996) in order to continue their journey of lifelong learning.

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