This paper describes an action research project undertaken in seven Queensland high schools during 2002. The aim of the project was to examine the implementation of units of work based on the recently developed subject syllabus in Industrial Technology and Design. The project involved state and independent schools in both regional and metropolitan locations and covered a period of seven months. The project represents a new development in research in that the project was funded by the Industrial Technology and Design Teachers Association of Queensland (INTAD). At the time of writing this paper, the project was not completed so this paper represents a “work in progress”

Introduction
Professional development and research are important components of the introduction of new work programs. During 2001 the Industrial Technology and Design Syllabus (QSCC, 2001) in Queensland was developed and approved by the Queensland School Curriculum Council (QSCC). In early 2002 Industrial Technology and Design Teachers Association of Queensland (INTAD) decided that the best way for the association to support the implementation of the new syllabus was to provide professional development to a select group of Industrial Technology and Design (ITD) teachers. Because the new syllabus involved a change from teacher-directed to more student-centred teaching strategies, INTAD believed that teachers would benefit from a more hands-on, and more intensive and sustained approach to professional development that more traditional approaches based on half or one day in-service programs. In addition, INTAD was keen to monitor the project in order to use the experience developed during the project to provide advice to teachers who subsequently implemented the new syllabus. The Centre for Technology Education Research (CETER) at Griffith University was commissioned to monitor the implementation using an action research methodology.

Background
In 1994 the national technology statement and profiles documents (Curriculum Development Corporation, 1994a & b) were released. These outlined the nature of technology education as one of the eight key learning areas proclaimed as part of the Hobart Declaration (1989). However, progress in implementing the technology key learning area has been slow. The slowness has been a result of at least three features. Firstly, the Hobart declaration mandated revisions to all KLA’s. The result of this is that state departments of education established schedules for the development and implementation of KLA’s and in most cases the Technology KLA was not first in the schedule. Secondly, the Technology KLA encompassed a range of existing subjects that were seen to have conceptual links to the Technology KLA. However, they had traditionally had no or little relationship with each other. The result was some competition as teachers and associations attempted to maximise their influence on the shape and direction of the new KLA. Thirdly, The Hobart Declaration mandated that KLA’s be introduced into schooling from years one or kindergarten to ten. This meant that a new curriculum area with new challenges was introduced into primary schools staffed by teachers who generally had no relevant training or experience and as a group were not favourably disposed to technology. In Queensland the QSCC took the decision that, in addition to the development of a Technology KLA, it was necessary to
develop what it describes as subject syllabuses. Subject syllabuses have been developed for Industrial Technology and Design, Home Economics, Agriculture, Computing and Multi-Media. The project described in this paper concerns the implementation of the Industrial Technology and Design subject syllabus.

Methodology
The overarching methodology was action research. The reason for selecting this method was based on concerns for the effectiveness of professional development and a determination to research the project in ways that supported the professional development. The success of the professional development and subject implementation exercise that was the subject of the research was regarded as problematic. That is, the implementation was seen as representing a significant change in pedagogy and there was a question mark over whether teachers would be able to make the change. Given this, it was felt that a more sustained professional development program was required and that it would be useful to monitor this in some way, both to refine the process as it went along, and to provide a refined and well-documented model for future in-service programs. For these reasons a modified action research methodology was selected. That is, action research is designed to be undertaken by teachers for the purpose of professional development. However, for this study, while teachers identified themselves as being involved in the professional development and the associated research, external researchers were involved. However, the research was consistent with action research principles (Gay & Airasian, 2000) in that teachers provided feedback on their developments and the study was based on teachers examining their own practice in the setting in which it takes place. The use of an external researcher is consistent with action research principles where the researcher provides: *External or peer observation involves having a peer or colleague observe, assess, and provide suggestions about an aspect of the teacher’s practice such as questioning behaviour, lesson organisation, or feedback to students.* (Gay & Airasian, 2000, 597)

Instruments
Data collection instruments consisted of classroom observations, interviews, teacher reflective journals of day-to-day progress and developments, and a monthly teleconference (six in all), where all teachers engaged in a feedback discussion with the external research assistant acting as facilitator. All tele-conferences were audio-recorded. Seven schools were involved in the study. Five were within the greater Brisbane metropolitan region and two were located in the country.

<table>
<thead>
<tr>
<th>Number</th>
<th>Location</th>
<th>System</th>
<th>Number of Staff involved</th>
<th>Level of Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Brisbane State</td>
<td>2</td>
<td>$1000</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Outer Brisbane</td>
<td>Independent, Church</td>
<td>1</td>
<td>$700</td>
</tr>
<tr>
<td>C</td>
<td>Regional State</td>
<td>2</td>
<td>$800</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Regional State</td>
<td>2</td>
<td>$1000</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Regional State</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Brisbane State</td>
<td>2</td>
<td>$1000</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Outer Brisbane</td>
<td>2</td>
<td>$1200</td>
<td></td>
</tr>
</tbody>
</table>
Results

Process & Observations

The project began with representatives from all seven schools attending an initial professional development (PD) day. The day occurred during school time and was intended to give all schools the benefit of an equal and progressive start. The PD program involved presentations from INTAD, the Queensland School Curriculum Council (QSCC – now part of Queensland Studies Authority, QSA), Education Queensland, and the researchers from Griffith.

Content of the PD included curriculum understanding, methods of unit planning, issues of delivery in school, assessment procedures, the role of the researchers, and description of action research and the data collection methods proposed for the study. While the day was considered successful many participants considered it a case of ‘information overload’.

The visiting intentions for each school were negotiated, as follows. Each school would have an initial visit during the time when they were planning the unit that would be their trial. A second visit was organised to view an example of classroom delivery and discuss how well the teachers considered their planned projects had now been transferred to the classroom. At the conclusion of this visit, a short interview was held with each of the teachers directly involved.

The intention of the first visit was to observe their planning process and format. It was not the researcher’s intention to discuss or offer opinion, even when these were asked for. Often the researcher had to make it clear that he was there to observe and report what he saw, without influence or bias, to the extent that this was possible. With many of the schools the first visit by the researcher was accompanied or preceded by a visit from a representative of the QSCC. This was not part of the initial plan but was useful in separating the roles of professional developer and researcher, with the researcher there simply to observe and record, and the QSCC representative to discuss and assist. This format was used with six of the seven schools. The more remote country school was visited by the researcher only.

Efforts were made to visit the schools at a time and date that was appropriate in terms of the timing of their project. Some schools had planned and started to deliver their trial projects prior to the initial visits by the researcher. It did not appear to hinder the continuity of the projects in any of the schools.

As the project continued, regular tele-conferences were held and recorded. The intention of the tele-conferences was to have regular contact with all participants and for each of them to offer updates on their own projects as well as to discuss and develop a better understanding of the developments in other schools. The tele-conferences were also used to provide running PD by INTAD executive members about issues of planning and delivery for student-centered learning approaches in Secondary Schools.

The second round of visits was scheduled to coincide with classroom delivery of the planned project. Considerable rearrangement occurred in the timing of these visits. All schools were visited with the exception of the more remote country school. A visit to this school was planned but was later cancelled due to another commitment. The continual rearranging of visit times and dates did highlight how busy these teachers were. In many cases there was only one class on at any one time that was involved in the trial. This made the timing of visits and then time afterwards to discuss and record the events difficult.
At the conclusion of the second visit a short interview was held (and audio taped) with the participating teachers. The intention of the interview was to record the teachers’ responses to the use and implementation of the subject area syllabus and to consider how this might influence their use of this syllabus in the future. They were also asked to comment on what they considered was the greatest success and any concerns they had at the time of the interview.

The project concluded with another professional development day. The intention of this day was to provide a vehicle for the participants to display student work and discuss their projects, and to offer constructive feedback on the projects. To offer expert advice on issues raised by the participants and consider where their efforts might now be focused. Staff from QSA, INTAD and Education Queensland attended the final PD day to contribute to the feedback and evaluation of the projects.

**Case Studies**

**School A**

Two teachers are involved in the trial with one being the HOD. This school focused on the use and development of a trial unit using the ‘Electroflash’ kits that were promoted at the INTAD professional development conference. The use of the kits and the intention to have students engage in ‘discovery learning’ were a focus for the HOD. Considerable background knowledge of electronics on the part of staff was required. The project was trialed with year 9. While there was interest in the project from the students, the initial trial did not provide the focus for students that might be achieved with a real application of the electronics knowledge they were learning. In addition, some students displayed reluctance to doing something different from what they expected to be doing. However, these problems were soon overcome.

The HOD commented that with five subjects coming under the label of technology in this Secondary School the Industrial Technology and Design teachers don’t see the students until year 9 and then only for one semester. Considerable concern that developmental time is not available to all students. The planning wizard available at the first conference was considered but not used in unit planning. Considerable time was spent in the planning stage, with a definite emphasis on wanting to ‘get it right’. Considerable debate about what needed to be included in a well-planned unit of work.

One concern expressed by the HOD was that historically, teachers have not had to spend so much time planning a unit of work. Most of the staff in the department are in their 50’s and are reluctant to consider the new syllabus. The focus on design-based and student-centered learning was not met with support from the majority of the department.

**School B**

There was considerable interest in the project from the HOD at school B and he was interested in including another teacher in the trial. The HOD has had some experience and interest in incorporating design into workshop projects over the past years. He is aware that this could be developed further and wants to convince other staff that design should be a central part to all projects.
A design brief was written around a simple, relevant idea that would relate to most students. While firm controls were kept on the variety of projects outcomes, students showed considerable improvement in design processes and a willingness to sketch and explore many possibilities. Freehand drawing skills were developed and used by all students. The teacher’s willingness to accept ideas that he (the teacher) hadn’t thought of, appeared to encourage more students to think creatively.

The issues of planning formats and then assessment and reporting were evident. The trial highlighted to the staff involved that projects at all levels needed to be either altered or re-written. This was an example of a good but small staff in curriculum development, making the teachers aware that they still had a long way to go. The expectation was that programs would be developed over time, rather the ‘throw the baby out with the bath water’.

School C
This school is three years old. Two teachers are involved in the trial. Both KLA and subject area syllabus are used within this area of the school. Two teachers were involved in the trial project. Both are very familiar with current curriculum developments. The school has an individual approach to project planning and delivery. Considerable time is invested in planning each new unit to included outcomes from all subject areas. It has taken the teachers time to adapt to this expectation in the school.

Some classes included aspects of design in the trial projects, while others ‘designed on the run’. One of the trial teachers focused on developing a manufacturing system to a preset project. Both teachers considered they had varying degrees of success. In one case teachers felt that students had developed considerable knowledge of the topic. This was done in both written and practical forms. This new knowledge did not transfer into a design-based project of any particular meaning. The new and ‘exciting stuff’ did not appear to be linked to any particular purpose or relevant design. The use of specialist and non-specialist teachers being used to teach technology was an issue in this school. This school also has the expectation that other teachers will deliver projects that will include ITD outcomes. These may, or may not be achieved. No transparent process of checking or moderating assessments was apparent.

School D
Two teachers are involved in the trial and there is a high level of support from the HOD. The school has a significant background of incorporating design into their workshop-based classes. However, this was evident in some classes but not in others. Knowledge of the subject area syllabus is very apparent. One of the teachers used the same trial project with two very different classes. A major success for this teacher was to ‘unpack’ and explain the learning outcomes being focused on in the project, so that the students could identify and realise when they were being achieved. The project involved new knowledge but not significant individual design.

The second teacher also included significant ‘new knowledge’. Equipment and machinery was being used that was not evident in most other classes. The focus was on manufacturing systems. Considerable emphasis on communication and cooperation was involved. In this school the Technology KLA was far more in evidence and considered more ‘important’ than the ITD syllabus.
Of significant interest to all teachers in this school are the issues of assessment, recording and reporting. The realistic expectations of assessment to outcomes (when they are only beginning to understand and plan to outcomes) was evident. Many issues were raised and answers hoped for. How will parents understand and react to terminology in a report that is significantly different? How does a student rank compared to another? Etc. etc.

School E
There was great enthusiasm from the HOD in terms of understanding the new syllabus and then providing the leadership for his department to embrace and use it in their classes. The HOD and one other teacher are involved in the trial. The HOD researched and studied relevant research and the new syllabus at length. At the heart of the understanding was the belief that the HOD wanted to encourage the students to be ‘designers’ and ‘technologists’. Considerable emphasis was placed in understanding and interpreting level 4 of the ITD syllabus.

The planning of the unit involved a set project and range of practical skills to begin with, then a design challenge to incorporate the set project. Investigation and research was an expected part of the design component only. The nature of the trial class involved two distinct age groups in the one class. The project chosen did not appeal to the older students until the design component was undertaken.

This was an example of a mature teacher making some changes to a project to incorporate design but still keeping aspects of a project under tight control with no opportunity for multiple outcomes. The teacher involved is a strong advocate of the new subject area syllabus and shows signs of developing more student projects in future endeavors.

School F
Two teachers are involved in the trial project in this school. This has come at a time when the HOD is absent from the school and there are significant interruptions to teachers within the department. Electronics was the focus of one of the two trial projects. It is hoped that this will ‘update’ the subject and attract a bigger range of students. Kitsets are used to build up knowledge and become familiar with components and circuits. A preset circuit is built for a predetermined function. The students have input into the design and manufacture of the case to house the circuit. The second project included a greater emphasis on design into a project that was already being undertaken by the students.

During the trial the first teacher realized that considerably more time was needed than was first thought. The trial group was a year 9 class. Consideration was given to putting the project into year 10 in future. The issues of when students come to the workshop classes, for how long and whether it would be compulsory for all students, came up often.

The teachers involved were often searching for answers and confirmation that they were doing well. The areas of planning for outcomes and assessment of these were two of the most obvious areas for questions. They put considerable effort into trying to ‘get it right’ and often needed a sounding board. As yet, there is little consideration that the KLA and ITD syllabus will have major impacts on what and how they teach.
School G
There are two teachers involved in the trial and there is a definite confidence within this school. They also have a trial underway for New Basics. A new HOD and teachers with training completed in the past few years. The trial project focused on Electronics and built up background knowledge in the year 9 class using preset examples in kit form. The students then had to construct a product that used a predetermined circuit but were expected to design and construct the body and look of the product. An in-class visit showed a strong approach to centre on the students and they all worked on individual projects. Many students commented that they had enjoyed the difference compared to other projects and had especially enjoyed the success with electronics.

New Basics and KLA documents appeared to have a greater influence than the ITD syllabus. The planning wizard from the INTAD conference was used. Again, another example of every student doing a preset component. This dominates what can be done afterwards with the project. Considerable variety in the look of students’ end products. Students appear confident enough to put their individual stamp on the project.

Considerable effort is being made by trial participants to support each other and take what they have learned and expand it into this growing part of the school. There is considerable support from the principal to develop this area of the school and development plans for implementation over the next three years have been created.

Summary
A fuller analysis is still to be undertaken, however, some general observations can be made.
1. The process seemed to work. That is, action research, tied to professional development, appeared to provide the kind of support and feedback to help teachers implement curriculum changed that has some realistic chance of being sustained.
2. The tele-conferences appeared to work and at a variety of levels. At one level they provided information. This ranged from information about curriculum and teaching from EQ officers to information about the researchers requirements. On another level it provided a gentle stimulus for teachers to keep on track with the project. This is probably important, given the many pressing calls on teachers’ time and the tendency to run out of time before completing tasks that may not be seen of immediate priority. On still another level, the teleconferences seemed to work to bind the participants together in a shared enterprise and provide a sense of community. This seemed to evolve over the course of the six teleconferences. Teachers moved from a more formal, and sometimes defensive approach to the conferences to a more collaborative, sharing one further into the project.
3. The changes achieved were nevertheless, reasonably modest, and highlight the need for on-going professional development and monitoring.

References