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5.1 INSTRUCTIONAL EFFECTIVENESS OF TELEMATICS

There are many factors that impinge directly on the effectiveness of a teaching programme. It is difficult to gain consensus on precisely what these factors might be and the relative importance of each. In this project we chose to employ a set of criteria that have been used in the local setting in our investigation of instructional effectiveness. The chosen measures are a series of generic criteria that have been developed and used in the measurement of student-teacher performance in practicum settings. It was decided that these were appropriate criteria to use in this evaluation because:

- the criteria are broad and able to encompass most aspects of teaching learning programmes over which teachers have some measure of control,
- the criteria provide a point from which more focused study could be undertaken if this appeared to be merited,
- Telematics teaching is distinctly different from conventional teaching and requires the development of a range of new skills and expertise on the part of practising teachers,
- the participating teachers in this study had only limited experience with this medium and were to all intents and purposes, novice teachers in this domain,
- the criteria against which the effectiveness of conventional teaching can be judged are consistent across other approaches,
- this system uses observation of classroom teaching as its principal data source.

The criteria against which the effectiveness and quality of the Telematics teaching were measured were:

- **Planning**, eg. establishing objectives, selection of learning experiences, preparing resources and aids, planning sequenced lessons, content knowledge, planning for all pupils' needs.
- **Teaching Strategies**, eg. use of appropriate methods, variations, adapting to individual needs, exploiting spontaneous situations.
- **Relationships**, eg. establishing positive relationships, promoting positive attitudes, enhancement of self-esteem, establishment of appropriate learning climate, use of group processes.
- **Communication Skills**, eg appropriate use of audio-link, level of language, screen displays, confidence.
- **Classroom Management**, eg. giving directions and instructions, utilisation of routines and rules, management of on-task behaviour, momentum and smoothness of learning, transitions, effective control techniques, management of resources and time.
- **Instructional Skills**, eg. beginning lessons, motivating learners, setting of learning tasks, questioning techniques, conducting effective discussion, explaining, extending learning, consolidating experiences, concluding learning, decision making.
• Evaluation, eg. marking, recording and assessing, checking levels of understanding, developmental measures and tests, formative evaluation.

Assertions

Using this set of criteria, data were collected from observations of teaching and learning. Analysis of this information was used to determine the influence of factors associated with each of the criteria on the learning opportunities and outcomes associated with Telematics teaching. Outcomes have been expressed as a series of assertions that are shown below. Data supporting the assertions are provided to give the reader an insight into the judgements made reasons for drawing such conclusions.

Assertion 1.
Successful Telematics teaching is strongly dependent on high levels of preparation and planning.

Assertion 2.
There is a need for more instructional formats and strategies to be developed to support Telematics teaching across disciplines.

Assertion 3.
Telematics teachers tend to use high levels of teacher-directed activity in their teaching strategies.

Assertion 4.
Many Telematics teachers are not discerning users of the technology.

Assertion 5.
Telematics teaching requires flexible learning environments that promote positive teacher-student relationships.

Assertion 6.
Classroom climates must be open and comfortable to promote student involvement and interaction.

Assertion 7.
Some physical contact between staff and student is advantageous in developing appropriate relationships.

Assertion 8.
Telematics teaching demands strong communications skills from teachers.

Assertion 9.
Telematics lessons need to involve appropriate mixes of teacher-led and student-led communications.

Fig 5.1
Assertions Describing Contributing Factors to the Instructional Effectiveness of Telematics Teaching
Assertion 10.
Successful Telematics teaching demands strong administrative and teaching support at the receiving school.

Assertion 11.
Established organisational systems are very important in Telematics teaching.

Assertion 13.
Telematics teaching requires strong technical skills.

Assertion 14.
Telematics teaching demands high levels of concentration and activity that is difficult to sustain over extended periods.

Assertion 15.
Evaluation and monitoring of student independent activity is essential to successful Telematics teaching.

Assertion 16.
Evaluations of lessons tends not to investigate instructional issues nor learning outcomes.

**PLANNING**

In assessments of instructional effectiveness, lesson planning is considered a key element. The planning process is critical to success because it is in this stage that the lesson objectives are formalised and linked to strategies and learning activities. During the planning stage, the teacher selects the resources that will support the learning and considers an instructional sequence that can achieve the desired learning outcomes. Appropriate student activities are selected and at all times careful consideration must be given to a programme that caters for the full range of individual abilities that exist in the classroom.

There are many things to consider in the planning of a Telematics lesson. The physical separation of teachers and students creates the need for specialised teaching materials. As well as the written materials, Telematics teachers need to prepare the computer screens that form the basis of the Telematics lesson. The reaction and response of teachers to these planning requirements have the potential to significantly influence the quality of the teaching and learning. Observations of the planning conducted by the teachers in this study led to the following assertions.
The levels of preparation and planning that accompanied the observed Telematics lessons were extremely high. The teachers took many hours longer to prepare Telematics lessons than they did for conventional lessons. The following examples across the different subject areas provide evidence and reasons for this.

**Social Studies.** The Social Studies curriculum delivered in the Geraldton region was customised by the delivery teacher for the Telematics classroom. The teacher had created booklets of notes and readings for the students that were built around a set of instructions to follow. Students were responsible for preparing themselves for lessons by reading the assigned material and completing associated written activities. Class sessions were typically spent in an interactive discussion mode where issues and outcomes arising from this work were discussed and developed by the teacher.

The facsimile connection provided the means for the teacher to send the instructional materials prior to each lesson. Previous experience had taught the teacher to send materials well in advance of scheduled class times to ensure its reproduction and distribution before the commencement of the lesson. As well as instructional booklets and readings, this teacher provided the remote students with particular texts and video-recordings. The Telematics teaching demanded a high level of planning and preparation that often took precedence over the teacher's other teaching duties within the school.

The Social Studies teaching was very much centred on discussion and interaction between students and teacher. The electronic blackboard did not appear to offer the teaching and learning environment any particular advantages over the oral link. The teacher found the creation of the instructional screens to be a particularly time consuming task and tended to use this component of the Telematics system sparingly. The teacher commented that on days when the computer connection could not be made, the lessons were frequently judged to have been as successful if not more successful, due to the lack of distraction caused by the computer.

**English.** The teacher of the English programme within the Geraldton region conducted the planning and preparation in a similar fashion. The students received notes and instructions ahead of class time and were required to carry out their reading and activity work between lessons. In the case of the English programme, there was less instructional materials prepared and delivered by the teacher compared to the Social Studies programme, but the teacher made regular use of the electronic blackboard and spent considerable time planning interactive activities and screens.
English within the Kalgoorlie region had its own unique problems. Although the teacher was ostensibly delivering the same course, due to the individual differences among groups and among students within groups, a number of unique programmes had to be created. The programmes consisted of different learning sequences, reading lists, activities and instructional events. The resulting programmes formed quite substantial booklets with up to 60 pages. Due to problems associated with reproducing materials in the schools, these booklets were reproduced and posted to the remote schools. This teacher made extensive use of the electronic blackboard and planning and preparation for individual lessons required significant amounts of times to prepare screens that were visually stimulating, interesting and built around some form of interactive activity.

Mathematics. Mathematics in the Geraldton region was delivered by a teacher from the Distance Education Branch. This teacher had ready access to mathematical materials produced for students studying in the distance education mode under the direction of the Distance Education sector. The Telematics course was ideally based on this material and much of the preparation for teaching undertaken by other Telematics teachers was not required in this instance. The students were given course booklets, assignments and self-paced instructional materials. The students followed the programme within the course in a self-paced mode. Rather than specifically teaching, the Telematics lessons were used to help the students with difficulties they had encountered and to provide alternative descriptions to those used in the teaching materials. It would be fair to say, that this course was more supported than led by the Telematics teacher.

Mathematics in the Kalgoorlie region posed similar problems to the teacher as did the English curriculum. There was a need to prepare many sets of materials to meet the needs of the individual schools and to support these materials with interesting, meaningful and interactively based instructional screens. Since all this material had to be prepared from scratch, the was a considerable level of preparation required for each of the lessons that was delivered.

In the Kimberley region, the mathematics programme was a transition course to improve basic mathematical skills and competencies. Since much of this learning is based on independent student activity, materials were required that provided worked examples, students activities and presented meaningful worked solutions. Again, the preparation of this material proved to very time-consuming for the teacher but necessary for a successful programme. The materials were faxed to the schools several days prior to a lesson to ensure that they were copied and distributed in time for the lesson. The teacher also incorporated activities from the instructional materials into the electronic screens.
In all schools and regions, Telematics teaching required the use of customised instructional materials to a higher degree than conventional teaching. It was evident to the researchers that without very high levels of preparation and training by the participating teachers, the quality of the programmes that were delivered would have been much less successful in achieving intended learning outcomes.

**Assertion 2**
There is a need for more instructional formats and strategies to be developed to support Telematics teaching across disciplines.

The forms of learning experiences planned and delivered by the teachers did not vary very much from one lesson to the next and from one school to the next. It was apparent that there was limited knowledge among teachers concerning variations to instructional formats. The teachers appeared to plan to employ a style of teaching that was used consistently. Several teachers stated that the need for a routine and the restrictions placed by the technology, prevented them from employing the variety of strategies and learning experiences that they that ordinarily would use in a face-to-face classroom.

The language teaching that was observed in this study was an obvious exception to the rule. The language teachers embraced many differing styles in their planning of content delivery and these included:
- use of varying media and instructional formats,
- competitions and interactions between students,
- independent activities, and
- game based instructional activities.

The language lessons tended to move at a brisk pace and to hold and challenge the students at all times. The materials that were used were predominantly the same as would be used in conventional face-to-face teaching and the teaching made extensive use of these for both class activities and independent tasks to be completed between sessions. There were times during the lessons when the teachers would stop talking and have the students complete independent tasks. It was apparent to the researchers that the methodologies employed by the language teachers were effective and drawn from considered use of the available resources.

There were many factors that made Telematics language teaching and learning different from that used in conventional classrooms. Interviews with the teachers revealed that the teachers were aware of the shortcomings and were using the measures at their disposal to minimise the disadvantages.

The main reason between the differences that appeared to exist in the selection of strategies and learning activities between language and other subjects was the form of training that had been given and the nature of the
instruction. Language teaching has had a longer exposure to Telematics than the other subjects in this study. The language teachers received a good deal of instruction from experienced language Telematics' teachers in the application and use of appropriate strategies. In the absence of this depth of instructional knowledge in the other areas, the teachers were shown generic strategies that could be applied across all subject areas and given plentiful instruction in management and instructional skills. In practice, this form of teacher instruction was reflected quite strongly in the forms of instructional programmes that were implemented and observed.

These observations led the researchers to conclude that following the example of the language teaching, it would be helpful for teachers of all Telematics subjects to be made aware of instructional strategies unique to their disciplines that are capable of providing the forms and levels of student activity and interaction required for successful learning. This type of information would best be drawn from the experience of the teachers themselves providing that they were able and willing to experiment and try alternative styles of teaching in the Telematics mode. In this way, teachers of all subjects could plan lessons that employed a variety of instructional practices that were known to be effective and useful to their ends.

TEACHING STRATEGIES

Teaching strategies are considered by many to be the most important factor in influencing student learning. While many of the other factors such as planning, communication and management are necessary components of good teaching, they alone are insufficient. It is the manner by which the content is presented, developed and consolidated that many consider to be the essential ingredient for successful teaching. The debate that rages over the effectiveness of different teaching strategies are testament to this conclusion.

The teaching strategies employed by Telematics teachers are prone to be limited by the distance between students and teachers and the reliance on the technology for communication and interaction. Previous research by Evans and Nation (1992) had drawn attention to the prospect that despite its interactive potential, Telematics teaching can become quite didactic in its approach and become very teacher-centred in the mode of less-effective classroom teaching. The following patterns emerged during this study and represent important influences on the learning outcomes likely to be achieved through Telematics teaching.

Assertion 3
Telematics teachers tend to use high levels of teacher-directed activity in their teaching strategies.
The researchers used observations of lesson delivery and lesson receipt as the principal means to gather information on the relative effectiveness of the differing strategies employed by the participating teachers. The researchers had extensive experience in classroom observation through previous research and participation in teaching practica. The following sections describes aspects of the teaching that was observed and includes comment on the influence of the differing strategies on the quality of the learning that could be achieved.

In a number of lessons, the delivery teachers used the total time allocated for the lesson in teacher-directed activity. This trend was apparent across such subjects as English, Social Studies and Mathematics. The lessons typically commenced with a greeting and a brief time to handle administrative requirements such as attendance. Once the lesson got underway, the teachers would perform such tasks as checking homework and going over problems that had been encountered. This process may have taken up to fifteen minutes and was then followed by the formal teaching that was planned for the lesson.

It was normally at the stage of the formal teaching that computer interactions were established. The formal teaching was typically centred on a series of examples and activities that the teacher had prepared using screens on the Electronic Classroom. The teacher would explain and demonstrate while seeking student responses and interactions. It was not uncommon for this to continue for up to thirty or forty minutes. The formal teaching would draw to its conclusion as the end of the lesson neared and small amounts of time were taken to set work to be completed for the next session. In all, it was not uncommon to view lessons in which the teacher-directed activity lasted for up to one hour.

Past experience and observations of student performance led the researchers to conclude that this level of teacher direction was too high and limited the effectiveness of the instruction in several ways.

• The nature of the teacher-student interactions sought spontaneous rather than considered responses. Questions sought recall and memory type responses.
• There were long periods of times when the students were sitting and listening. Many were not able to retain high levels of concentration and interest across the time span of the lesson.
• High demands were placed on the teachers whose performances tended to diminish towards the ends of the lessons. Sixty minutes was a long time for a teacher to concentrate in such a difficult teaching situation. Teachers often finished the lessons quite exhausted.
• There was no opportunity given to students to apply the skills, concepts about which the lesson was concerned. The teaching approaches were very much instructivist oriented.

The high levels of teacher-led activity that characterised the majority of lessons were similar to those reported by Evans and Nation (1992). The
tendency of the teachers to maintain discourse with students was brought about by the application of the technology more so than considered and effective teaching practice. This aspect of the teaching remains an area that requires alternative strategies to be developed and reflective practice of the part of the teachers to ensure that consideration is given to appropriate mixes of teacher-direction and forms of student activity.

Assertion 4.
Many Telematics teachers are not discerning users of the technology:

It appeared that the majority of the teachers felt compelled to make maximum use of the full range of technologies provided and that this use was not directed by the objectives or content of the planned teaching and learning. The media trap to which Dunnett (1990) refers, appeared to be catching many of the teachers and exerting an undue influence on their selection of learning experiences. Some of the examples that led the researchers to this conclusion included:

- The extended times given to teacher-directed activity using the media. There was a tendency to over-use the visual and interactive link provided by the computer connection. This may not have been so long had the technology not held such an important place in the teachers' minds.
- Low-level interactions with the computer. The teachers spent many hours planning interactive activities for their lessons that involved the visual computer link. In the main these activities offered little to the teaching and learning process. Their use was primarily as a motivating activity.
- The training received by the teachers was heavily directed towards developing their skills in use of the computer technology. Teachers tended to feel that if the computer was not an integral part of the lesson, they were not using the system well. Technology was leading their decision making processes.
- Interviews with the teachers revealed a lack of application on their part of the pedagogies that would normally be applied in conventional teaching. The teachers were not giving the Telematics lessons the same level of pedagogical planning that went into conventional teaching. Rather they were applying the limited set of strategies that they had been shown in their training programmes.

The teachers' use of the technology reflected the training that they had received. In many cases, the influence of low levels of previous computer experience was also evident. These conditions created an environment in which a high proportion of the instructional activity was guided more by the capabilities and features of the technology than the learning outcomes being sought. This is a consistent feature across many teaching applications involving technology and frequently acts in a manner that
limits the full teaching potential to be achieved. It is a problem that appears to be solvable by changes and additions to initial and in-service training.

RELATIONSHIPS

The relationships that a teacher establishes with the students within a classroom play an important part in the teaching and learning process. The establishment of positive relationships with students enables the teacher to create a learning environment that is conducive to learning. Positive relationships create motivating environments that build constructive attitudes in students that can contribute significantly to learning. In classrooms with positive learning environments, the self-esteem of students are held in high regard and the learner is considered to be important and valuable. Students are encouraged to contribute to the learning and to work with each other in supportive groups. The teacher plays an important part in establishing the conditions that are supportive of this form environment. In Telematics teaching, it is more often more difficult to create the best environment for learning. During this study, the following observations were made concerning the teacher/student relationships that emerged.

Assertion 5.
Telematics teaching requires flexible learning environments that promote positive teacher-student relationships.

The physical separation of teachers and students in Telematics lessons creates a need for special forms of relationships to develop between teacher and students. In the first instance, the teacher is compelled to place a good deal of trust in the students. This level of trust is far greater than one might expect in conventional teaching. In face-to-face teaching, teachers tend to place more trust in their older students. In Telematics teaching it was apparent that the teachers tended to treat their students as though they were older than they really were.

There was plentiful evidence in the observed Telematics teaching that the teacher-student relationships played a very important part in determining the success of lessons. It was important for students to lead in much of the interaction and not to hold back when responses were sought. Whereas in conventional classrooms where non-verbal clues provide teachers with information concerning student participation and motivation, the Telematics classroom prevents these clues from being used. Students who are reluctant to participate can limit the pace and progress of a lesson. These students must be encouraged coerced into offering responses and feeling comfortable and confident when doing so.
A number of instances provided evidence of the value and potential that could be gained from teacher-student relationships that were open and flexible. In one subject, the teacher frequently allowed students to control the host computer during lessons. The host computer is the one that controls the interactions and responses on the system. By passing control of the system across to the students, the teacher was effectively handing over the controlling mechanism of the lesson. By operating the host computer, the students had to cooperate among themselves in managing this control while other students (and the teacher) on the system interacted through them. The whole purpose in passing the control to the students was to provide the flexibility for the students to control the screen interactions prepared by the teacher, in much the same way as a teacher might hand students the piece of chalk during a lesson.

The need for students to act in a responsible and trustworthy fashion is paramount in the Telematics environment. Several experiences described by teachers made this patently obvious. One teacher described a lesson during which a question was directed to a student. The reply came from the students that "Johnny was no longer in the class". Further questioning revealed that Johnny had left ten minutes earlier to go and have some lunch. Under the circumstances, this is a very hard problem to avoid unless the students are on-side and responsible. In another school, a Telematics teacher was quite surprised when her lesson was interrupted by a teacher in a remote school declaring that he had just returned three students to the class. The remaining students in the class had been successfully covering for these three by answering questions directed to them and responding for them when required.

Several schools in the project had enrolled students into the Telematics programme after they had agreed to conditions of behaviour and responsibility in a form of contract. The students accepted that their participation was a privilege and that this had to be earned through appropriate levels of commitment and hard work. This process worked very well and these very young students impressed everyone by the way in which they undertook their work in a responsible and diligent fashion. They responded so well in fact that the supervising teacher that was to sit in with them was no longer needed.

Developing and increasing the levels of responsibility required from, and shown by, students, is an aim of schooling that is frequently overlooked in conventional teaching. The presence of the teacher in the classroom often creates levels of extrinsic motivation among students that limit the need for these behaviours to be developed. Telematics teaching requires higher levels of student motivation than conventional teaching and lacks many of the support mechanisms of conventional teaching. The development of a supportive and cooperative classroom environment in which a natural element was high levels of student responsibility, was observed to be a critical element for successful teaching.
The importance of classroom environments in fostering climates for learning is an established factor in conventional teaching that is also very important in the Telematics applications. In conventional teaching, teachers have a range of devices and strategies that they can employ to bring students into lessons. Often it is the physical presence of the teachers that best brings this about.

A critical element in Telematics teaching is achieving this same level of interaction in a setting where the teacher is not able to exert such an influence. Observations of lessons and interviews with teachers revealed that a strategy that was frequently employed by the teachers to promote student involvement and participation was the creation of a learning environment that was open and non-threatening. As one teacher remarked, "this form of learning is more the way that you would teach adults than children". Many teachers found themselves relaxing their normal modes of teaching to bring about a warm and friendly environment that encouraged students to participate and interact. The conventional teacher-student relationships appeared to be relaxed for Telematics teaching to create the form of climate that successful teaching requires.

There appeared to be some problems experienced by teachers and associated with the less formal atmosphere and teacher-student relationships. For example:
• there were instances of students leaving rooms unannounced,
• the completion of assigned work was less than desirable in some instances,
• uninvited interactions between students in the remote classrooms was a distraction,
• there was tendency for lessons to be totally given to teacher talk and student response.

The problems associated with the classroom environments were relatively minor problems that could be handled with appropriate changes and organisational procedures. The classrooms that were observed where the climate was less conducive to the required levels of interaction and communication saw teachers working very hard to draw students into the lessons and spending considerable lengths of time inviting and encouraging responses that might have been better used in developing the lesson content.
In several of the schools, a camp was held towards the end of the year to enable both students and teachers to meet each other. This was seen by all to be a very valuable part of the course and developed a great sense of rapport among the participants. Although everyone knew each other before the camp, the limited level of knowing that can be achieved across the wires was made particularly evident by the far greater friendships and bonds that had emerged by the end of the three days. These are the forms of bonds and friendships that are taken for granted in conventional teaching. The lessons that followed the camp clearly demonstrated the new bonds that had been formed. The lessons yielded significant increases in levels of interaction and communication between students.

Although it is possible for students and teachers to interact across the airwaves in ways that mimic the face-to-face interactions, it is never possible to completely come to know people without actual contact. The camp situation made this very clear. Many measures had been employed to help students to get to know each other. Descriptions of each other were exchanged early in the programme together with photographs and short biographies. Despite all these measures, the contact between students from participating schools with each other and with the teacher, lacked the level of rapport and familiarity that comes with really knowing the other person.

The high level of enthusiasm gained from the camp must obviously considered along with the strong recreational environment that it carried. The true measure of the success of the camp came from the teachers who all judged it to have contributed very strongly to developing and instilling student relationships that were able to enhance subsequent teaching and learning environments. Although camps may not be possible nor desirable in all settings, this study found that there was distinct advantage to be gained from the student and teacher relationships that were developed from face-to-face contact.

COMMUNICATION SKILLS

The communication skills of a teacher are a very important determinant of the teacher's potential instructional effectiveness. The ability to get the message across in a clear and concise fashion is the gift of a talented teacher. Communication's skills provide the capacity to state one's intentions and guide learners lucidly while maintaining students' interest and enthusiasm. In conventional teaching, teachers have a range of verbal and non-verbal mechanisms that can contribute to the communication process. Most teachers use their bodies and faces in many ways as they interact with their students. The Telematics teacher has only a voice for communication and this must be used with a great degree of versatility if it is to provide the necessary support for the teaching and learning process. The teachers in this study used their voices in a variety of ways to achieve the intended learning outcomes. Aspects of the communication
process that appeared to be consistent among Telematics teachers and that appeared as influencing entities during this study are described below.

**Assertion 8.**
Telematics teaching demands strong communications skills from teachers.

There are many aspects of Telematics lesson that inhibit normal communications between students and teachers. The lack of a visual link between the interacting parties makes the voice link that much more important. But the voice link has many problems. The sound is sourced using omnidirectional and small microphones frequently causing voices to be unclear and distorted. When students speak together, the two voices are hard to hear and hard to distinguish. The teacher cannot see when students are waiting to speak. The teacher cannot see expressions on faces that provide clues about the questions asked and the responses being formulated. Above all the teacher cannot see who is listening and who isn't. Altogether we have a very difficult environment for communicating.

For this reason, the teacher must become a very good communicator to extract the most from the system. Our observations showed some teachers were very good communicators in this mode while others struggled with a resultant diminishing quality of teaching. The good teachers followed the forms of communicating protocols that one might see described in texts for beginning teachers. Examples of sound practice included:

- asking question and after a pause nominating a respondent,
- checking a list each time a student responded to ensure the participation of all students,
- waiting for an appropriate length of time to give students the full chance to answer questions,
- repeating and paraphrasing responses to ensure they were understood by all,
- using questions to test understanding rather than to deliver content,
- using signals to indicate that a question was about to be asked to focus students' attention.

It was apparent that the teachers who appeared to be the better communicators were also the teachers who gave most consideration to the development and consolidation of the lesson content across all students. These teachers posed questions at a variety of levels to cater for the individual differences within a classroom. The same teachers challenged students with their questions and probed understanding.

There were communications between teachers and students that appeared to be less than effective and that could be considered to limit the teaching and learning opportunities. Some of the practices included:

- leading questions that really needed no answers,
low level questions that served simply to delay the delivery of lesson content,
• questions that could not be understood and that required paraphrasing many times,
• questions that were answered by the teacher after short delays providing students little chance to offer responses,
• questions of a general nature to the whole of the class that elicited group responses.

The communications skills required for effective Telematics teaching are in many cases the same as those that make conventional teaching successful. While average or poor communication skills can still support teaching in a conventional setting, in the case of Telematics teaching, the inherent problems add to the communications problems to significantly limit the instructional effectiveness.

Assertion 9.
Telematics lessons need to involve appropriate mixes of teacher-led and student-led communications.

There was a high level of teaching activity observed that could best be described as teacher-led. This form of teaching activity saw the teacher asking questions and seeking responses from students in a continual fashion throughout lessons. The very high levels of teacher-led activity caused the researchers to consider that this style of teaching needed also to contain forms of expression that came as a result of student rather than teacher initiatives.

The high levels of teacher-led communication and activity appeared to be caused by a number of factors:
• the perceived need of the teachers to maintain a dialogue throughout the lesson,
• the need to maximise use of the telecommunications links which remained open throughout the lesson,
• a perception that the higher the level of interaction, the greater the achieved learning outcomes,
• use of instructional strategies that included only minimal levels of independent and other forms of student activity,
• the teaching styles employed were based on those developed through in-service and training and these courses emphasised this form of interaction.

In conventional teaching, there is usually a high degree of student initiated communication. This is usually achieved by students raising their hands and in many classrooms, students feel free to use this mechanism at any time. In the Telematics classroom, there appears to be no successful alternative to raising one's hand. To gain the teacher's attention, a student must interrupt the existing dialogue. Since this is not an acceptable
practice, it appeared that it was not done and this form of interaction had removed itself from this sphere of teaching. There were of course instances when the teacher sought student responses of a general nature but this could not and did not replace the need for a spontaneous mechanism for student-initiated instruction.

There are many other forms of communication that are useful and effective in classroom teaching. Given classes with students from different schools and regions and the nature of some of the subjects, there appeared to be a lot for teachers to gain by including a level of inter-student communications. In instances where students were encouraged to speak among themselves, the dialogue was interesting and rich and more importantly, able to contribute to the intended learning outcomes.

The researchers judged that developing an instructional style that gave more freedom to students to communicate among themselves and with the teacher in student-initiated settings, was something that teachers would have to experience if they were going to see its value. Moreover, the teachers would need to be guided by others who had successfully employed this techniques, as to the ways and means in which it could best be done and the learning opportunities that could be exploited this way.

CLASsROOM MANAGEMENT

A principal concern of many novice Telematics teachers relates to questions of classroom management and control. In situations where the teacher is physically removed from the classroom, it would appear that management of the teaching/learning environment might pose unique problems. The limited experience that has been gained in Telematics in local schools has been used to create organisational strategies for novice teachers to follow. In-service courses for intending Telematics teachers provide the attendees with countless tips and suggestions, the majority of which relate to management and control practises.

Given the importance of classroom management on the establishment and maintenance of successful learning environments, this study sought to determine the forms and types of management strategies that evolved in different classrooms in the project. Observations of typical teacher behaviours and practices were used to create the following assertions concerning the activities of the teachers and the resulting influence on the quality of the teaching and learning.

Assertion 10.
Successful Telematics teaching demands strong administrative and teaching support at the receive school.
Teaching via Telematics creates an unusual situation in a school in that a number of the students become the responsibility of an external agent for some time during the day. Schools tend to be familiar with situations where students are placed under the care of a person or persons who are not members of the school community. The difference in this case is that the person who is responsible for the children does not come on-site. This situation poses several problems for the external teacher, many of which can limit the effectiveness of the teaching programme. Some of the areas that pose particular problems are discipline, management and maintenance of equipment, resourcing, and assessing and monitoring student performance.

It was clearly evident in this study that at schools where there was strong administrative and teaching support, the Telematics programme was effective and well managed. In fact experiences in schools where the support was minimal, led many to question the viability of the teaching as a whole. There were numerous examples where poor management caused the value of the programme to be seriously questioned.

In schools where the support was minimal, the resulting organisation saw students:
• completing subjects that were beyond their scope and abilities,
• infrequently miss lessons,
• have difficulty making the equipment work correctly,
• often fail to submit assignments,
• not complete assigned tasks between lessons,
• not receive materials that were sent to them by the delivery teacher,
• miss other classes to attend Telematics lessons,
• have lessons that ran over breaks and during lunchtime.

As well as students experiencing difficulties within the programme, the teachers delivering Telematics to these sites also experienced serious problems. Some Telematics teachers spoke of:
• being unable to contact the administration in the receiving schools, receiving no information on holidays and special days when the students would be absent,
• having no idea of what reporting or assessment requirements were in place,
• receiving no academic background or profile on their students,
• having great difficulty following up enquiries about students' performances or behaviours.

In all, it was apparent that poor support and administration either caused or was a result of, a poor attitude towards the programme and demonstrated a real lack of commitment and appreciation. There were two schools in the project that had decided to withdraw from the programme after it had run for one year. Staff at both these schools were not convinced that Telematics was able to offer the advantage that they had been promised. In both schools, the support for the programme had
been minimal and had contributed significantly to the problems that caused the decision to withdraw.

Conversely, there were receiptal schools where the administrative support was very strong. In such schools, teachers assumed responsibilities towards the programme and students. The teachers performed such tasks as:

- sitting in on lessons to see what was being taught, what requirements were being made of the students and ensuring that connections and equipment were all working,
- providing contact between the Telematics teacher and the receiptal school,
- receiving and delivering instructional materials,
- encouraging completion of, collecting and forwarding student assignments, and
- attending to tasks required to support the teaching.

In schools where the support was strong, there was typically a high standard of achievement among the students, and a high level of interest and motivation at the school to continue the Telematics teaching.

Assertion 11.
Established organisational systems are very important in Telematics teaching.

Telematics teaching is an activity that is fraught with potential problems. Every small part of the process including software, hardware, courseware and the people involved, can exert influence on the level of success of the activity. There are many perils that can prevent or hinder lessons and these perils frequently emerge when they are least expected and least required. In the period of the observations of this study, some of the perils that were observed and impeded lesson delivery and transmission included:

- lightning strikes in one region putting all telecommunications off the air for twelve hours,
- the delivery teacher falling sick and having to cancel the lesson,
- the delivery teacher waiting thirty minutes for contact from her class in order for a lesson to start only to find that the school had gone on an excursion and there were no students,
- students informing the teacher midway through a lesson that they had to leave to go to an assembly,
- a teacher sending instructional materials to the Telematics site only to find that the fax machine had no paper and there was no way that any could be obtained for at least a week,
• the delivery teacher trying to contact a site by telephone to make arrangements with the supervising teacher and being unable to make contact because the office was not manned,
• the delivery teacher getting system errors when trying to make the computer link after a new system had been installed,
• the delivery teacher unable to use the computer link during a lesson because the students at the remote site had different versions of the Electronic Classroom software,
• the delivery teacher having spent two hours creating instructional screens for a lesson finding that they could not be retrieved and used at the time of the lesson,
• students at the remote site unable to make use of the computer link because the mouse had been removed from the system, and
• the delivery teacher transmitting several screens for an interactive component of the lesson and having to retransmit 4 times before the data actually appeared at the remote sites.

This list of disasters, as that is what they should probably be called, is not a comprehensive list of what might happen. The stories told by the Telematics teachers about their worst incidents makes much better reading. It serves to exemplify the fact that for Telematics to work and thus to be successful, there are many contingencies that have to be considered. It is only through the use of good systems and management strategies that these contingencies can be minimised and avoided to the greatest possible extent.

The Telematics teachers in the study who had the best control of the teaching and learning environment were those who established and used consistent management and organisational strategies in the teaching programmes. These strategies related to:
• setup and maintenance of the computing equipment,
• established organisational strategies within their classrooms, and
• systems and strategies of support from the coordinating teacher in the receiveal school.

In these settings, the teachers could be relatively confident that when they delivered a Telematics lesson, there was a high probability that technical and organisational problems would not limit its success. In schools where less rigorous systems were evident, the incidence of disruptions were higher. Of course, even the best laid plans can be destroyed by unanticipated events and that appears to remain the spice of life of the Telematics teacher.

Assertion 12:
Consistent classroom routines and practices contribute significantly to instructional effectiveness.
As with most forms of teaching, with experience, teachers tend to develop procedures and systems that are able to improve aspects of the instructional programme and help lessons to run smoothly and to plan. It was evident from observations from all Telematics teaching, that this is a specialist form of teaching that has its own unique instructional requirements and problems. Across all classrooms there were a number of strategies in use that helped the teachers in their teaching.

Most descriptions of Telematics teaching provide hints and tips for the teacher and there is now a growing number of instructional strategies that appear to have universal application across all forms of Telematics teaching. Often the strategies are written as 'tips for the teacher'. Examples include:

- Send out materials in advance of the teaching so students will be familiar with them at the start of the lesson.
- Use colour codes for the materials, for example blue for notes, pink for assignments, yellow for timetables and tasks etc.
- Get to know the students before the programme starts by making telephone contact, exchanging photographs and reading academic profiles.
- Use a checklist to keep a tally of contributions of students in a lesson. Refer to the tally to ensure an equitable participation.
- Use a checklist of stages in the lesson to guide delivery and to keep times consistent.
- Transfer screen images at times when the computer is not being used for instruction, eg. during the administrative times when attendance and completion of assigned work is being checked.
- Have a monitor in the group whose responsibility is to tell the Telematics teacher when the group is ready having moved from one phase of the lesson to the next.
- Establish a roster for making the computer connections so when lessons commence, someone knows to make the connections and links to the teacher.
- Establish routines for passing control of the computer among students in each class.
- Have systems for when students need to leave the room and when they return.

The application of consistent classroom routines and practices for Telematics teaching is vital as it is in conventional classrooms where similar strategies are employed. Our observations led us to classrooms where the teachers used differing levels of routines in their teaching. It was evident that in classrooms where the strategies were consistently employed, more effective teaching and learning was possible:

- there were fewer delays within the lesson as students knew how to act as the lesson entered different phases without having to be reminded, transitions between lesson phases were faster,
- computer interactions were shared,
- students worked cooperatively and in unison.
Most of the instructional skills that are useful Telematics teaching can be learned by new teachers through in-service and training. Experienced teachers are continually refining the teaching/learning processes and developing new strategies. There is a need for interaction and communication among teachers to enable this information to be exchanged.

INSTRUCTIONAL SKILLS

The instructional skills required for successful Telematics teaching are necessarily similar but different from those used in conventional teaching. Instructional skills tend to be able to be learned and developed from experience. Moreover they can frequently be learned from theory as distinct from practice. The instructional skills that were observed during this study to be effective and able to positively influence learning, are described below.

Assertion 13.
Telematics teaching requires strong technical skills.

All teachers in the PCAP Telematics project were experienced teachers with strong reputations in their schools. It was evident that the teachers had well developed instructional skills in conventional teaching and that many of these skills had been successfully applied to their Telematics teaching. The new skills that the teachers considered were critical to their success with Telematics were those given to knowing and understanding the technical side of the new technology.

Many of the teachers joined the project, in their own words, as computer illiterate. Nine months later they were very proficient users of the technology with skills enabling trouble-shooting and problem solving with the equipment. The requirements placed on these teachers in planning, preparing and delivering lessons with the technology demanded strong technical skills and in some instances, the teachers still had not fully achieved the required level of expertise.

The demand for the need for strong technical skills was due to the following factors:
• most teachers were in remote schools with restricted access to other trained technology people. They were the only people who could use the computer and needed to be totally self-reliant in this use,
• not only did the teachers have to be able to use the technology successfully themselves, they needed to train others including teachers and students,
• the reliance of the technology on communications links attracts many extra problems. Many problems exist with communications
equipment in rural areas causing it to be frequently unreliable and faulty,

- Telematics uses the full range of features available on the personal computer. Its application requires an understanding of the combined actions of many discrete components, and
- when problems arise they must be solved quickly if they are not to disrupt lesson delivery. Quick solutions require an understanding of the system so that consequences can be drawn back to causes. Strong technical skills and understandings are required for this.

The Telematics teachers in this project performed extremely well given the level of training that they had received. Most were very resourceful people who were able to keep a cool head in crisis situations as problems arose. Many times, they were compelled to work around problems during a lesson and to seek a solution at the end. This usually meant delivering a lesson without the computer communication component relying totally on the audio link. During the observation of teaching, teachers were observed to be tackling equipment problems while simultaneously interacting with the students. The technical actions had to be almost automatic to them if the technology was not to interfere with the teaching. Such occurrences had to be accepted and could not lessen their enthusiasm or interest due to the commitment they had undertaken when joining the project.

It was apparent to the researchers that Telematics teachers need very good training to provide the technical skills required for the teaching. If the training is incomplete, the teachers are compelled to gain the required skills through practice and experience accompanying Telematics teaching. It is important that trainers at both pre-service and post-service levels recognise this need for computing skills and act accordingly in the courses that are being designed and delivered to encourage and support the development of general skills in computer usage among all teachers.

**Assertion 14.**
Telematics teaching demands high levels of concentration and activity that is difficult to sustain over extended periods.

One aspect of Telematics teaching that appeared to influence learning outcomes but that did not seem to ever be discussed was the issue of the most desirable length of a Telematics lesson. In many schools, the length of the lesson was chosen arbitrarily when the programme was planned and it was not uncommon for lessons to extend up to an hour or beyond.

Although an hour is not a particularly long time in conventional teaching, the rigours and demands of Telematics makes an hour a very long time in this format. Some of the characteristics of Telematics teaching which contributed to this were:
• the consistent dialogue between students and teachers compelled both to concentrate heavily for very long periods,
• the use of telecommunications required all parties to listen carefully and attend closely to all aspects of the lesson. It was not possible to participate in a relaxed manner,
• the high level of teacher directed activity necessitated high levels of planning and instructional design on the part of the teacher, and
• since there were two sets of communications lines open during the lesson, teachers felt compelled to make full use of their capabilities.

Observations of lessons at both the delivery and receiveal points provided significant amounts of evidence to suggest that the length of lessons were frequently too long:
• teachers frequently provided direct instruction and dialogue for periods exceeding forty minutes,
• teachers rarely set tasks for students to complete independently for consolidation and rehearsal,
• there were few instances observed when the students were able to work among themselves to complete tasks and activities,
• students' interest and attention noticeably waned as the lessons progressed, and
• the level of teacher communication increased as the lessons progressed as students became less interested and returned shorter and less considered responses.

The teachers of the language courses appeared to have more effective instructional models in their lessons that the teachers of other subjects. They broke their lessons into small sections. They incorporated a range of varied instructional strategies that included small group work, independent activity and student-student interactions between schools. By varying the instructional formats during the lesson, it was evident that these teachers were able to make full use of the contact time. This was in distinct contrast to teaching in other schools where after thirty minutes or so, the quality of the teaching and learning processes appeared to drop off significantly.

There appears to be a need to examine the instructional formats available to teachers across different subject areas in order to create learning environments that can sustain student interest and enthusiasm and that can provide the range of learning experiences that are needed to ensure understanding can be developed. There is a tendency among many teachers not to reflect on their teaching practices and to deliver lessons with Telematics using restrictive and difficult instructional strategies. The solution for this problem would appear to come through further research and development in pedagogical rather than technology issues.
EVALUATION

Evaluation strategies provide the means to measure and assess both teacher and student performances. Knowledge of student performance is critical to teaching success. The information can be used as both formative and summative data against which progress can be monitored and instructional programmes altered to meet the students' needs. Evaluation also enables teachers to assess their own performance and through this to modify and vary practices and strategies to improve the learning potential.

Normal methods of evaluation are frequently unavailable to the Telematics teacher. It is not possible to view student scripts to make informal judgements of progress. Formalised testing procedures are made difficult by the distance between student and teachers. At the same time, the need for valid and reliable assessment strategies remains strong and necessary for successful teaching. The following assertions describe some of the evaluation and practices that were observed and that had the capacity to impact significantly the quality of the teaching and learning.

Assertion 15.
Evaluation and monitoring of student independent activity is essential to successful Telematics teaching.

The performance of a number of students across regions in the PCAP project were judged to be unsatisfactory from the viewpoints of both the Telematics' teachers and staff at the students' school. Close scrutiny of poor performances frequently revealed poor progress on the part of the student in completion of the independent activities set for completion outside class time. Telematics teachers tended to rely on the motivation of the students to complete and submit assigned tasks. In instances where there were only light measures in place to enforce and encourage completion of work, many students failed to keep up with the course requirements.

These events were usually found to occur among students in schools where school supervision was not a high priority. In such instances, the delivery teacher often had difficulty in contacting the supervising teacher and the situation of incomplete work was able to go on. In class situations when the Telematics teacher sought explanations from students, there were promises of submissions that frequently were not kept. The Telematics teachers frequently expressed frustration with the level of incomplete work but accepted that this was a factor of the delivery mode. There was only token efforts made to enforce student submissions through contact with the receival school supervising teacher.

In schools where supervision of students was strong, submissions were able to be kept up to date as was student progress and performance. This
demonstrated that Telematics teachers do not have to accept poor standards from their students and the way to improve this problem is the close checking and monitoring of submissions and organised contact with supervisors to ensure that course requirements are met. Teachers who do not maintain good records of the students' submissions and performance in independent tasks cannot expect to achieve success with all students. While Telematics teachers can have problems enforcing the submission of work, this should not be a problem for the supervising teachers if they are informed.

This facet of Telematics teaching raises some interesting questions concerning the powers and responsibilities of the Telematics teacher. Although this person has ultimate responsibility for the students' progress in this subject, that responsibility must be shared with staff at the delivery school. It is important for another teacher(s) to share the responsibility and to provide the necessary on-site support and backup that is required by the Telematics teacher and that cannot be successfully achieved at a distance.

**Assertion 16.**
Evaluations of lessons tends not to investigate instructional issues nor learning outcomes

Discussions with teachers and observations of lesson delivery and receipt provided many examples of Telematics teachers in this study, applying what is sometimes called a *visionary approach* to assessing outcomes. This approach assumes that because the technology is used and a lesson occurs, then the activity has been a success. The high profile of the technology in this instructional context provided an environment where judgements of this kind were made frequently.

Evidence for this assertion comes from the consistency of approach used by Telematics teachers. There was little variation from one lesson to the next in terms of lesson format and instructional processes. In all settings, the teachers adopted instructional sequences with which they were comfortable and consistently applied these formats without variation from one lesson to the next. There were many reasons for adopting this approach:

- it limited the prospect of problems arising in delivery caused by technology failure or malfunction,
- the teachers were only ever shown one approach or style of approach in their limited training experiences,
- there was little contact between Telematics teachers that might encourage or facilitate exchanges of ideas or discussion of the teaching processes,
- the consistent routines aided the management of students and teaching processes.
Because the teachers were embracing consistent approaches, there were few instances where a teacher was seen to question the learning outcomes against the instructional processes being used. There was almost an implicit assumption that this is how it has to be done and there is really no point in considering alternative processes.

It would appear that the teachers' implicit confidence in instructional processes being employed was a factor that could impede the technology from achieving maximum gains. The same level of confidence in the approaches being used were also evident among the trainers and project coordinators. One example that demonstrates this was when the researchers questioned the forms of approaches that were being taken in a particular subject and suggested alternatives that limited the use of the computer screen. The response from two parties very close to the process was that such an approach was similar to the school of the air approach. Since this approach had now been superseded through the technology, it was a backward step to consider its use any more.

This were clear indications that Telematics teaching in this study would have benefited from more critical and reflective practices on the part of the teachers. The limited evaluations of learning outcomes and instructional approaches seemed to hinder and prevent advancements that could bring about increased learning gains and more effective applications of the technology.
5.2 EFFECTIVE SUPPORT AND MANAGEMENT SYSTEMS

A critical component in the success of Telematics as a curriculum delivery mode in rural schools must be the support and management systems that sustain and maintain the programmes. While the study investigated aspects of the instructional programmes that influenced the outcomes from the Telematics programmes in the PCAP schools, these programmes could not have been undertaken without support systems and it is this aspect of Telematics that is the focus of this part of the paper.

Telematics is not an activity that schools can undertake in isolation. It requires collaborative and cooperative efforts between schools. When schools participate in collaborative and cooperative efforts, there are many factors that can contribute to and influence success. This part of the report presents the findings from this study into these factors. The purpose was to examine in practical settings, ways and means to ensure that Telematics would be successful in implementations among schools and strategies to follow to ensure this success.

The support systems for Telematics draw from three main areas which are all relatively independent players in the process. These areas represent factors at the school level, the regional level and finally the system level. Effective coordination and management across all three levels would appear to be an essential component in maintaining and sustaining Telematics as a viable and effective delivery platform in rural schools.

School level.
At the school level, the management and coordination involves:
- curricula, the selection of appropriate curriculum offerings,
- students, the selection of students for the programmes,
- resources, the provision and maintenance of the resources and equipment for the lesson delivery and receipt and
- staffing, the provision of adequate staffing to support the teaching programme.

Regional Level.
This level represents the combined activities of the schools participating in the projects. Among the schools, important management issues concern:
- curriculum offerings, deciding which schools will deliver which programmes,
- timetabling to ensure compatibility of programmes,
- support systems, consistent practices among schools, and
- programme expansion, assisting other schools to become part of the programme.

System Level.
The system level represents activities across the whole of the education system that can aid in the Telematics process. Some of the activities supporting Telematics at the system level include:
• training for the teachers and administrators,
• equipment support and maintenance,
• networking, the provision of communications links between all schools,
• research and development to monitor and improve techniques, processes and outcomes.

Assertions
From these organisational and administrative levels, a number of assertion have been drawn that reflect the findings of the study and the judgements of the researchers. These assertions suggest strategies and outcomes that link learning and teaching outcomes to the manner in which Telematics programmes are planned and implemented.

Assertion 17.
Telematics delivery and receiveal requires the use of a special purpose room.

Assertion 18.
Strong supervision and coordination must be provided for Telematics teaching in schools.

Assertion 19.
Telematics skills and expertise should be developed broadly across school curriculum areas and staff.

Assertion 20.
Telematics programmes are enhanced through planning and management within local clusters or groups of schools.

Assertion 21.
Programme organisation and planning within clusters is aided by the creation of agreed policies and practices relating to programme delivery and receipt.

Assertion 22.
Improved efficiencies to Telematics programmes are achieved through exchanges of programmes and courses.

Assertion 23.
Telematics is well served by training and support programmes provided through a central agency.

Assertion 24.
A need exists for research and development activities that seek ways and means to improve teaching and learning.

Assertion 25.
The inclusion of computer and technology literacy as an essential component of teacher training merits immediate consideration.
SCHOOL SUPPORT

Assertion 17. Telematics delivery and receipt requires the use of a special purpose room.

The schools that participated in this study had organised their equipment and resources in a variety of ways and under a number of differing conditions. The physical locations extended across a wide continuum from placement in classrooms to placement in single-purpose specialist rooms.

It was immediately apparent that the optimum placement was in those schools where the equipment was in a specialist type room. Some of the reasons for this assertion were:

- **The need for security of the equipment.** In non-secure settings, essential equipment was found to be removed from some systems and configuration changes made to the software causing problems with communications. It is essential for both teachers and students that there is 100% reliability in equipment and this can only be guaranteed when the equipment can be isolated from general use.

- **Interference in lessons.** When Telematics is delivered or received, there is the prospect that activities going on around can be interfered with or can interfere with this lesson. In one school, classes had to be taken elsewhere each time a Telematics lesson was to be held. In another school, external sounds caused the sound-activated microphones to continually be clicking in and out over the top of the lesson.

- **A need for overhead projection screen display.** In classes where the numbers of students require the screen image to be displayed using the overhead projection panel, the room must be darkened. This is usually impossible in a large general purpose room.

- **Cabling and connections.** The operation of Telematics requires many cables and connections. This creates a situation where the equipment requires a fixed and permanent location. When it is placed in non-specialist rooms, there is always the prospect that it will have to be removed at some later date as the requirements for that room change.

There are other benefits to be gained from the use of a special purpose room. Among these is the capacity of the teacher or coordinator to configure the furniture and equipment in the most appropriate ways. A number of different configurations were observed during the study and the majority of the configurations in non-specialist settings were unsatisfactory in one form or another.

The placement and organisation of the Telematics equipment in classrooms was difficult to manage if each student was to have similar access to the input devices and screen image. Typically, the equipment was placed on conventional furniture organised in the best possible way to provide access to the input devices while providing students with
adequate working space for themselves and their materials. Some of the common problems in setup were:
• The monitor was at desk height limiting its viewing envelope.
• The keyboard and mouse cables were of insufficient length to reach to the students sitting furthest from the computer.
• Cabling of the computers, modem and telephone created large amounts of cables and a cause for a number of disconnections of teacher and students.

The most common configuration of furniture was to form small tables from the classrooms into a larger rectangle and to place chairs around the table with the computer in a central position at one end. This arrangement gave each student some desk space for books and was judged the most efficient way to position students around the equipment. Which ever way, the equipment was organised, the mean distance from students to the screen was approximately 1 metre.

In schools where Telematics was able to be placed in a special room, many advantages apart from security, organisation and other problems identified earlier, were gained:
• photographs of classmates were able to be displayed,
• charts showing instructions for use of the equipment were clearly displayed,
• materials and resources required for lessons were on hand,
• learning materials could be displayed in the room,
• timetables and deadlines could be displayed to inform and remind students of requirements,
• teachers were able to access instructional materials, software and hardware manuals,
• teachers could use the equipment for lesson preparation at times when students were not using the equipment, and
• telephone line security was enhanced.
In schools where Telematics is yet to be installed or where the equipment is only temporarily placed, consideration of these factors will help to ensure that the optimal placement can be made.

Assertion 18.
Strong supervision and coordination must be provided for Telematics teaching in schools.

There are many possible ways in which Telematics can be configured and implemented in schools. This study provided examples of a broad range of supervisionary models employed among schools in the different regions and clusters of schools. From the observations of classroom practices and interviews with both teachers and students, there emerged clear patterns between the levels of supervision and coordination provided and quality of the teaching and learning processes. The current assertion was derived from this information findings.

Supervision.
In conventional classroom teaching, there is one teacher who is responsible for the students' learning and progress. The teacher is given a degree of professional freedom to carry out the duties to achieve the required learning goals. This freedom includes selection of teaching resources, materials, strategies and instructional sequences. There is rarely any help sought as this activity is quite capable of being performed by the single person.

Telematics teaching on the other hand, removes the teacher from the physical classroom and those tasks that normally require face-to-face contact cannot be performed. The problems associated with this have been discussed in the previous section. To ensure that the teacher receives the necessary teaching support, it seems vital that the teaching responsibility is shared with a teacher at the receiveal school, that person being required to act for the teacher in whatever ways are required.

The provision of the supervising teacher demands a level of commitment from the receiveal school. In fact this condition frequently causes there to be two teachers conducting the class, one in a teaching position and the other in support. In ideal classroom environments, as were observed in some classrooms during this study, it is possible for the supervising teacher to act in a support role in a very low key manner. For example, physical presence during lessons may not be required. Having a nominated person though, provides a clear line of communication between the delivery teacher and the teaching staff at the receiveal school. This condition seems essential for the efficient and effective conduct of Telematics.
Coordination.
We use the term coordination to refer to the process whereby the Telematics programme in a school is planned and implemented. It is usually the school principal or a nominated deputy who assumes responsibility for the Telematics programme. This is because the programme can be quite invasive in terms of influencing existing programmes in schools. Some of the influences of Telematics on schools were observed to be:
- increased teaching loads for staff who were required to supervise Telematics lessons,
- increased teaching loads for staff who were delivering Telematics lessons,
- increased financial costs to the school in supplying equipment and resources to support the project,
- changes to school timetables to facilitate Telematics teaching, and
- changes to the educational programmes of the students studying via Telematics.

With this level of impact, it was important that the Telematics programme was a valued part of the school educational programme and that support for the project extended from the administration to the teaching staff. There were varying levels of support for the projects across the schools in the study. It appeared to the researchers that support could become a Catch-22 type situation. Where support was strong, enthusiasm abounded and the Telematics teaching was successful and appreciated. This condition grew further support and plans for increased activity. In other schools, where support was weak, the programmes often did not achieve to their true potential. For example, students were not supervised and feel behind in their work. The consequence of this weak support was reduced outcomes and this lead to a further weakening of support and in some cases a move to withdraw from the project. Thus across two schools, the same level and form of teaching could be highly successful in one and unsuccessful in another. Much of the success draws from the commitment of the school community to ensuring the success of the project.

Assertion 19.
Telematics skills and expertise should be developed broadly across school curriculum areas and staff.

In many of the schools involved in the PCAP project, Telematics was used sparingly to deliver perhaps one or two subjects to a small number of students. It became evident to the researchers that under these conditions, there were many missed opportunities and poor economies of scale. One of the biggest problems in increasing the participation in Telematics was the small number of trained Telematics teachers within the school. There were several reasons for this:
• in-service training in rural schools is difficult to organise and expensive to implement,
• the skills required to develop confidence and competence in Telematics are broad and technical,
• there is reduced opportunity in rural schools for teachers to become technologically literate and comfortable,
• teacher transience in rural schools is very high and trained Telematics teachers rarely stay very long.

There was the prospect that the trained Telematics teachers in the schools might tutor their colleagues to develop their skills and expertise with this technology. It was evident in many of the schools, that the only teachers who had an inclination to learn to use Telematics from their trained peers were those who had had extensive experience with computer technology and were comfortable with the hardware and software. This creates interesting issues about the levels of computer literacy and technology awareness that teachers should be expected to have. This issue is raised as an item that has implications for Telematics at the system level.

The survival and growth of Telematics among the rural schools was seen to depend heavily on their capacity for self-help and exchanges of teaching programmes. The use of Telematics places strong demands on the resources of rural schools and to participate freely, School A has to be able to offer School B a curriculum in return for one from them. This exchange or swaps of subjects becomes efficient when two or more schools become involved and economies of scale come into play. There is a need in the rural schools for more teachers to be able to offer their instructional expertise to the programme to increase the subject offerings, to improve subject selection and provide a set of choices for participating schools.

There were a number of schools in the study that saw little prospect of being able to trade Telematics teaching due to the limited size of their staff and the small numbers of trained Telematics teachers. It was apparent that increasing the numbers of trained staff in schools would result in an expansion of possible curriculum offerings and help to sustain and maintain the programme among the smaller rural schools.

REGIONAL SUPPORT

Assertion 20.
Telematics programmes are enhanced through planning and management within local clusters or groups of schools.

It is possible through the use of telecommunications to deliver Telematics lessons across vast distances. In fact many of the teachers and administrators within the project, openly canvassed the idea of having a list circulated of all Telematics delivery within the state to increase the
options available in terms of curriculum offerings. From the experience of the schools in this project, however, it became apparent that delivering and receiving Telematics beyond regional boundaries could pose more problems and solutions and run the risk of limited effectiveness.

There were a number on instances in the project where the distance between delivery and receival schools was quite excessive, up to 1000 kms apart. Although not reported as part of the evaluation, there were some instances when Western Australian schools and teachers joined with classes in the Northern Territory. Other large distances were to be found in the Kalgoorlie region where Telematics was delivered to schools in the Central Desert region. The delivery from Newman to Exmouth was over 1000 kms. Some of the problems associated with these distances included:

- delivery and receival schools being in different time zones making compatible timetabling very difficult,
- differing public holidays and school holidays,
- increased communication costs over local area communications,
- difficulties associated with any attempt to meet or assemble with students,
- differences in curriculum objectives and courses makes programme selection more difficult, and
- strong cultural differences between aboriginal students across geographically separated classes.

In contrast, there appeared to be a number of advantages to be gained from organisation and collaboration within local regions:

- schools and teachers are associated for many activities other than Telematics,
- it is likely that students and teachers will meet in other contexts,
- planning is enhanced by the capacity of the administrators and teachers to meet with each other,
- groups with regional ties share common interests and common goals,
- compatible timetables and holidays are more easy to arrange,
- there are natural clusters of schools within the education system sharing common goals and funding bodies,
- where primary schools feed to the secondary schools, compatible programmes can be planned, and
- common curriculum goal and objectives.

Organisation into clusters appears to be a common element of Telematics programmes throughout Australia. As moves are made to economise courses and to seek efficiencies of scale, there will be a natural tendency for schools to look beyond their boundaries for collaborative partners. It was evident in this study that although the expanded boundaries may create more opportunities for programme selection, the programmes are likely to be more easily and implemented and managed within the local regions. It was apparent that the control and direction of programmes were best managed within local contexts. Making use of programmes
from other regions is a distinct possibility but it did not appear to be a wise move to consider coordination and planning from afar.

Assertion 21.
Programme organisation and planning within clusters is aided by the creation of agreed policies and practices relating to programme delivery and receiveal.

At the regional level, the need for a set of common policies and practices in lesson delivery and receiveal was clearly evident in this study. The programme commenced with only loose organisation in this regard and the participating schools and teachers quickly recognised the need for firmer organisation.

Planning for 1993 was undertaken in December 1992. This planning involved subject selection, selection of delivery teacher and selection of students for the programmes. By the time the programme was due to start, many changes had occurred throughout regions and the implementation of the programme was severely restricted by this;

- Many of the trained teachers left their schools on transfers to other schools. In a number of locations, there were no trained Telematics staff left in school that were planned to receive Telematics lessons.
- Transience of students from one year to the next saw schools with planned Telematics programmes no longer requiring these services.
- Delivery teachers commenced the school year with programmes prepared and ready to implement only to find their students' needs changed and receiveal schools totally unprepared for their programme.
- Programmes were commenced with delivery teachers having little knowledge of their students' backgrounds, abilities and needs.

High transiency levels of staff and students can be quite common in rural schools. In this study, it was evident that such occurrences caused problems for the Telematics programmes and that contingencies were required to lessen the impact on the Telematics teaching. To overcome this, the schools started to organise and implement a series of standard practices and policies that could become part of the general school organisation. To achieve this the schools all had to agree on the necessary steps to be taken and this involved changes to existing policies and practices. By carrying out this task in small clusters of schools, the policies were relatively easy to frame and implement and to be included in documentation that would enable consistency to be achieved as other factors changed in the schools.

The school policy and planning in relation to programme delivery extended from minor instructional considerations to significant changes to school activities. An example of this is the agreed code of conduct accepted by schools in one region. A set of agreed practices was compiled and
became the basis by which Telematics would be delivered and received between schools. The guidelines were as follows:

- regular teleconferences among Telematics personnel to maintain strong lines of communication,
- circulation of school planners to advise teachers of special events and activities that would interrupt programmes,
- a commitment by all staff in schools to expand the sense of ownership of the programme from a few to many,
- the supply of standard information on participating students to delivery teachers,
- agreed practices in establishing lesson communications and sharing costs,
- support personnel for each Telematics subject created as part of a teacher's duty statement,
- standards of support to be given by supervising teachers, and
- participation in in-service and professional development activities in Telematics teaching.

In regions where the implemented programmes faced fewer difficulties, the need for established guidelines was not evident. Since the success of such activities as Telematics teaching are as good as the weakest link in the process, the provision of agreed policies and practices among schools is seen as an essential element in maintaining and sustaining effective Telematics programmes.

Assertion 22.
Improved efficiencies to Telematics programmes are achieved through exchanges of programmes and courses in clusters.

The Telematics teaching that was observed in this study was made possible by special funding arrangements. One of the key elements in the research was to investigate whether the programmes could be self-sustaining and able to continue when the funding ceased. The funding purchased equipment and paid for the teachers who delivered the programmes. Communication costs were borne by the state authorities. If the programme was to be self-sustaining in the future, it would be necessary for schools to organise to deliver their own programmes in a form of exchange.

There were many problems that suggested that this would be a difficult goal to achieve:

- the need for both a delivery and receiveal teacher made the use of Telematics very demanding on staffing,
- the lack of trained Telematics teachers limited the types and numbers of subject offerings that could be made from the smaller schools,
- uncertainty about staffing for the new year posed problems in planning courses,
uncertainty in student places from one year to the next also posed planning problems, and
the need to plan for viable class sizes necessitates pre-planning between numbers of schools.

Despite these problems, there were regions and clusters of schools where the Telematics programmes were able to be planned and implemented without further financial support and where these successes occurred, there were distinct patterns in both the programmes planned and the nature of the planning:
• regions identified particular problems for which Telematics was a solution, For example, in one region, there was a general wish to provide instruction in a second language across all schools. This desire was a shared desire and encouraged the collaborative activity that resulted in it being carried out,
• there was strong cooperation and collaboration in planning programmes. Where some schools could not offer programme exchanges, others gave up resources to provide the necessary support,
• student interests were paramount in the planning. Whereas schools had many interests to consider in their planning, the prospects of improving students' learning opportunities tended to lead discussion and be given prominence in the decision making.

It was evident to the researchers that the level of commitment and enthusiasm that went into the planning process was aided considerably by the shared interests and bonds between the schools in the clusters and regions. Beyond these groups, it appeared that there would not be the essential ingredients required for the planning and organisation to be successful.

SYSTEM SUPPORT

Assertion 23.
Telematics is well served by training and support programmes provided through a central agency.

Telematics is a technology whose application is limited mainly to rural schools. Its use and application across these schools is quite consistent and there are few differences to be observed from one end of the state to the other. All Telematics teaching uses similar forms of equipment and similar instructional strategies and processes. Although there is considerable benefit to be derived from planning and organising instructional programmes within regions, this study demonstrated significant advantages could be gained from overall support mechanisms that were delivered across all clusters and regions.

This study involved four regions that undertook projects in an independent fashion. System support and training, however, was
coordinated across all regions and there were many positive outcomes achieved by this:

- equipment sourcing was facilitated and costs reduced due to bulk purchasing,
- correct equipment configurations were ordered,
- training costs were reduced by the use of joint programmes across regions,
- links were formed with Telematics teachers in other regions facilitating communications and information interchange,
- system updates and implementations were coordinated across regions,
- sources were identified for technical support.

The development and use of a coordinating group across the regions created a small group of people with high levels of expertise able to provide support for the rural teachers. The planning and conduct of training programmes by these skilled personnel ensured that the beginning teachers received the forms of training required for independent activity. Coupled with the training programmes were effective support mechanisms that teachers could use when required.

One region chose to provide its own support systems and time release from teaching was given to a regional officer for this purpose. In practice, this system was not successful due to several reasons:

- the technical knowledge required to support Telematics extended to the Macintosh platform and a number of specialised software packages. The support officer while having sound technical skills was not able to draw on the required level of knowledge for many of the problems that were encountered,
- technical support can be required at any time and immediate solutions are often sought. Part-time support personnel cannot provide this level of service,
- technical staff in regions are typically far removed from the hardware and software sales and service points. This creates another impediment in being able to deliver fast and efficient service,
- technical problems tend to be consistent across schools and regions. A support person across all regions is in a far better position to solve and apply technical problems than people operating independently within regions.

The support groups that serviced the Telematics projects in this study were a large factor in the success of the programme delivery. The high levels of broad expertise across technical and instructional domains, held by members of the group could not be replicated in the regions or within the schools. The group established and provided a networking system for communications between teachers and acted as an impetus for much of the interaction and dialogue that was achieved. It was apparent that the extensive use of Telematics across the state system was well served by the central agency that was able to coordinate support and training activities and structures.
Assertion 24.
A need exists for research and development activities that seek ways and means to improve teaching and learning.

Telematics is a unique and characteristic teaching tool whose implementation involves a range of skills and expertise distinct from conventional teaching. The application is in its infancy and there are clearly many improvements that are possible to improve the effectiveness of the medium as an alternative form of instruction in rural schools. Currently there is little formal or organised research and development in this field. Further research and development has a capacity to significantly improve teaching and learning in this domain.

One of the factors that inhibits research in this field is the distance over which the technology is spread and applied. The small numbers of students and the nature of the teaching and learning makes it difficult for individual teachers to experiment and to accurately judge the consequences of these actions. Whereas in conventional teaching, teachers can make many judgements about their instructional styles from the reactions of students, reactions from Telematics students are difficult to gauge. Despite this, a major part of the knowledge base that currently forms the pedagogies associated with Telematics teaching is derived from personal experience and judgement. Little empirical data exists to aid the Telematics teacher.

This study has identified a number of areas where further research and development could benefit existing programmes. Some of these areas include:

- **Pedagogy.** The development of appropriate instructional strategies across different curriculum areas, researching to seek optimal forms of interactivity and communication between teachers and students.
- **Curricula.** Developing curriculum materials for use in this form of teaching with which teachers could plan and develop their own curricula.
- **Instructional Materials.** Creating templates for instructional screens, developing sets of appropriate clip-art, developing generic forms of interactive materials.
- **Equipment.** Developing specialist communication equipment and peripherals for learning in this mode, eg. using alternative pointing and writing devices, wireless peripherals, researching optimal configurations of equipment.

Assertion 25.
The inclusion of computer and technology literacy as an essential component of teacher training merits immediate consideration.

This final assertion is based on the premise that while instructional technologies are becoming more and more commonplace in school settings, there are still many teachers who graduate without having
completed any formal training in the use of these technologies in their teaching areas.

There was a general feeling among the support personnel in this project, that newly graduated teachers could not be Telematics teachers because of the difficulties associated with learning to teach and learning to use the technology simultaneously. Based on their experiences, new graduates were very unfamiliar with technology and had to be trained from a very low level before they could become comfortable with the technology.

It would appear that with Telematics becoming so widespread in rural schools, and with so many teachers receiving their first appointments in such schools, the need for appropriate technical skills is an important issue that should be treated in the programmes of teacher education. As technology is becoming an important tool in the rural teacher's arsenal, this should be reflected in the training required by pre-service teachers. Edith Cowan University has been quick to identify this situation and we now have a project in place that will see Telematics instruction being a critical component of the teacher training received by its graduates.
6.0 DISCUSSION

This paper has reported on an evaluation project conducted into the implementation of large Telematics project in Western Australia. The report has considered aspects beyond the brief of the evaluation and has sought to identify aspects relating to instruction and programme delivery that could improve practice and the quality of the teaching and learning. Through the evaluation process, it was possible to determine patterns in the responses of the participating Telematics teachers. This information was compiled to provide guidance to future project planners and coordinators and was listed in the form of suggestions and recommendations. These recommendations are given below.

Equipment Recommendations
The project appeared to be using an optimal computer processor in the LCII. In some instances, the peripherals limited the effectiveness of the teaching and some possible changes to standard equipment might lessen problems. It would be useful to consider:

- a larger screen eg. 14” because so many sites use this as the sole display among small groups,
- DUCT conference system for audio link, the hands-free telephone is not suitable,
- a printer for hardcopy output of lesson notes for delivery and receival. This would enable the system to be used in preparation of supplementary lesson materials,
- a faster modem. Depends on the quality of lines but transfer of screens and data is time consuming and at this stage takes too long. Wherever possible, it would be preferable to have access to faster communications,
- avoiding the purchase of overhead projection panels and projectors, these tended not to be used or to be of limited value when used,
- use of graphics tablets as input devices for language and mathematics teaching applications. The mouse is not well suited to freehand drawing as is required in these contexts.

Administrative Recommendations
There appears to be a need to formally produce some guidelines for schools to adopt when planning Telematics teaching. These guidelines should clearly indicate the pitfalls and traps that can be encountered and indicate the steps that could be used to avoid them. For example:

- providing academic profiles of students to delivery teachers,
- choosing appropriate subjects for Telematics teaching,
- choosing and training students,
- creating a budget for the Telematics delivery teacher,
- choosing rooms for Telematics teaching, and
- guidance for support teachers.
Teacher Training & In-service Recommendations
It is necessary to consider ways to streamline the delivery of Telematics training to new teachers and to experienced teachers. There are, and will continue to be, problems at all sites with staff transiency. A large number of the schools involved in this project will have no trained Telematics teachers on-site in 1994. There appears to be a greater demand than supply of trained Telematics teachers.

Some possible solutions to this problem are:
• a video or set of videos on such topics as using Electronic Classroom for reception, setting up a Telematics classroom for reception, being a Telematics support teacher, teaching with Telematics. These tapes could be used as part of an independent learning module with further in-service supplied through Telematics from a central location,
• encouraging teacher-training institutions to include some basic training in Telematics in their undergraduate programmes,
• the creation of a set of guidelines for Telematics teaching and reception. These could include guidelines for establishing subject offerings, organising Telematics in the school, procedural and administrative policies that support the teaching and duty statements for participating staff.

Few teachers were observed to use more than the basic facilities of Electronic Classroom in their teaching. This included simple text screens with very elementary graphics. Experience had shown that the use of more graphics while greatly increasing lesson preparation time, caused very long delays in transfer time.

Further developments of the software seem to be aimed at creating more opportunities for graphics when existing facilities were not being utilised. One could question whether the technology should be leading and guiding new versions of the software or whether teaching considerations should be playing a part. The upgrade from version 1 to Version 2 caused a number of problems in schools and there was a wonder if upgrades on the basis of need might better serve the teaching and teachers.

Networking Recommendations
The Telematics staff at schools have all had considerable experience now and it would be useful to facilitate exchanges between them to improve the quality and effectiveness of the teaching and learning. Some ways in which this might be achieved include:
• the production of a newsletter,
• the facilitation of electronic networking,
• a register of Telematics teachers and subject specialisms,
• a register of current and planned Telematics offerings,

With an effective form of networking in place, many economies could be achieved in the delivery of Telematics teaching. Some of these might be:
• sharing of prepared course materials,
• sharing of appropriate resources eg. clip-art and lesson screens.

It was apparent in some of the schools that e-mail is being planned and implemented to increase the level of networking. While this is a positive step, and will help greatly to increase the exchange of ideas and materials, it must be seen as one of a number of ways to improve networking. No one system can totally achieve the objective on its own.

System Support Recommendations
Telematics teaching appears to offer the most to the smaller rural schools. It would appear that the supply of equipment and appropriate training will not be enough maintain Telematics programmes in many of these schools. Although many of the smaller rural schools have a need for Telematics, they appear not to have the capacity to offer any delivery programmes in return for programmes received. Problems faced by administrations within smaller schools include:
• fewer specialised staff,
• recent graduates with minimal teaching experience,
• transient staff, and
• little flexibility in staffing arrangements.

On the other hand, the largest sources of teachers for Telematics delivery are in the larger schools in the regions, for example, the Senior High Schools and larger District High Schools. These schools, however, need some form of incentive to participate. They cannot be expected to deliver programmes at their own cost.

A logical solution is to provide funding to support Telematics teaching from these large schools. The creation of a Telematics teaching position at a large school could be shared among staff with appropriate expertise. The participating schools could coordinate their needs to ensure that subjects could be offered to meet their needs.

Such an activity would require additional funding at the system level. If social justice is an issue that is to be addressed, costs will have to be incurred and it is the opinion of the author of this report, that Telematics provides the most cost-effective solution to this problem.

The Ministry of Education seems quite inflexible in its administrative procedures and policy given to staffing. The LOTE programme appears to offer evidence of this. In this instance, primary schools were offered a 0.1 FTE teaching allowance for the establishment of a LOTE programme. A move in the Geraldton region to establish a LOTE teacher delivering lessons through Telematics to a number of rural schools was not supported since the rules stated that in order to receive funding, the teacher needed to be resident in the school. Many schools in the region did not have access to an appropriate LOTE teacher in the town and as a consequence, unnecessarily missed out on the opportunity.
Teaching with Telematics Recommendations

Interactive Computer Usage. There is still a lot to be learned about the most effective ways in which Telematics can be used. In many of the lessons that were observed, the computer was a useful but not essential component of the teaching process. Its purpose was observed to be for motivation and interest and played no direct or integral part in the teaching. For example, in teaching English, it was used as a communications platform for activities where the ideas may just as effectively been created on paper. There appears to be a need to investigate the optimal forms of computer usage appropriate in different subjects and settings because large economies appear possible in some instances.

Modem Connections. In Applied Computing, one was left to wonder if the better mode of communication may have been direct modem connections between students and teacher to facilitate the passing of computer files. The use of a modem would have provided direct benefit over the Electronic Classroom in this setting due to the fact that the students were learning to use other application packages and the use of Electronic Classroom would have impeded this in the lesson setting. A modem connection could be made at a fraction of the cost of communicating with Electronic Classroom.

In other instances, the computer did have an important place. For example, in mathematics it was used to demonstrate mathematical procedures in activities that saw the teacher using the screen. In LOTE it was observed as an interactive device to show students the formation of character and to check that they were writing them correctly.

Teaching Time. Many of the observed lessons lasted for periods up to one hour. During that time there was a total teacher direction with the teacher and students in conversation and dialogue. This mode of teaching would never be used in classroom settings. Conventional teaching sees a far greater level of independent student activity. In the Telematics teaching, there was observed to be very little independent student activity. It would appear that reducing the level of interactivity by half in most lessons would have achieved very much the same effect. Variations to the teaching patterns observed could serve a dual purpose of creating efficiencies in the teaching learning programme while significantly reducing communication costs.

There seems a need to more fully investigate this mode of teaching to increase economies. Factors that could be studied include:

- reducing the computing component to that which is essential to learning outcomes,
- investigating other communications facilities eg, modem connections for transferring files,
- blending more independent activity with Telematics teaching,
• reducing linked time and making more effective use of the support teacher for teaching supervision.

CONCLUSIONS

Telematics teaching is a powerful and flexible delivery tool that has the capacity to significantly lessen the disadvantages suffered by rural students in access to specialist education programmes. This study has identified a number of issues related to the effectiveness of the use of Telematics for programme delivery. This information will be passed to the important stakeholders in a number of ways:
• through a report to the organisers of the PCAP project and the Telecommunications Support Unit of the Western Australian Department of education,
• through journals and publications to teachers and teacher educators,
• through conference attendance and presentations to teachers and teacher educators,
• through courses of instruction to students at our university completing teacher education programmes at both the undergraduate and postgraduate levels, and
• through further research and development activities with the Telematics teachers and administrators of Western Australia.

The success of Telematics ultimately rests with the teachers and administrators in rural schools who choose to use Telematics in programme delivery, who plan and deliver the lessons, and organise and manage the programmes. Throughout this study, we had the privilege and pleasure to work with many of these people and gained a high level of respect and admiration for their enthusiasm, dedication and endeavour. We are convinced that much of the success that has been achieved and will be achieved with Telematics, is due to the efforts of these hard working people.
APPENDIX 1

Schools and sites visited during the evaluation.

Geraldton Region
DEC West Perth
Jurien Bay DHS
Carnamah DHS

Pilbara Region
Newman SHS
Karratha SHS
Wickham DHS
Paraburdoo DHS
Tom Price HS

Kimberley Region
Broome HS
Nulungu College
La Grange RCS
Sacred Heart College, Beagle Bay

Kalgoorlie Region
Kalgoorlie DEO
Leonora DHS
Menzies DHS
Staff Interviewed

Ms Jo Wilson, Ministry of Education,
Mr Phil Blunt, Northern Territory Ministry of Education,
Mr Graeme Cross, Geraldton PCAP Field Officer,
Mr Dick Pascoe, Kalgoorlie PCAP Field Officer,
Mr Dave Whitney, Kimberley PCAP Field Officer,
Mr Brad Snell, Kimberley PCAP Field Officer,
Ms Debbie Lange, DEC West Perth
Mr Bill Powell, Jurien Bay DHS
Mr Mike Atkinson, Carnamah DHS
Ms Chrissy Gault, Carnamah DHS
Mr Peter Havel, Mt Magnet DHS,
Ms Carome Jenkins, Meekatharra DHS
Mr Mike Lees, Meekatharra DHS
Br John Bushell, Tardun Agricultural Boys School
Ms Wendy Hewitt, Newman SHS
Mr Don Boyd, Newman SHS
Mr Brad Snell, Pilbara District Office
Ms Lisa Thompson, Karratha SHS
Mr Mark Whisson, Wickham DHS
Mr Matt Wren, Paraburdoo DHS
Mr Clyde Graham, Paraburdoo DHS
Mr Geoff Ransome, Tom Price HS
Ms Terry Turner, Halls Creek DHS
Ms Leigh Makin, Kununurra DHS
Mr Paul Larkin, Broome HS
Ms Anna Garton, Nulungu College
Br Kevin Ryan, Nulungu College
Ms Hilary Morup, La Grange RCS
Mr Joe Firenze, Beagle Bay RCS
Ms Jane Lawton, Yintarri RCS,
Ms Sandy Pascoe, Laverton DHS
Ms Sue Kerr, Kalgoorlie DEO
Mr Sam Henderson, Leonora DHS
Ms Eileen Hooper, Leonora DHS
Mr Luke Clatworthy, Menzies DHS
Mr Chris Partington Albany PCAP Field Officer
Mr Phil Darling, Lake Grace DHS
Mr Bruce Blay, Ravensthorpe DHS
John Boyland, Leinster DHS
Ms Julianne Sugar, Utilities Management, WA Ministry of Education

Written reports were received from:

Ms Lesley Westlake, Blackstone RCS
Mr David Marten, Warburton RCS
Mr Steve Delfs, Wiluna RCS
Mr Jim Heslop, Warrakurna RCS
# APPENDIX 2

Abbreviations commonly used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>DHS</td>
<td>District High School</td>
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<tr>
<td>SHS</td>
<td>Senior High School</td>
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<tr>
<td>HS</td>
<td>High School</td>
</tr>
<tr>
<td>RCS</td>
<td>Remote Community School</td>
</tr>
<tr>
<td>DEC</td>
<td>Distance Education Centre</td>
</tr>
<tr>
<td>PCAP</td>
<td>Priority Country Areas Programme</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
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<tr>
<td>LOTE</td>
<td>Languages other than English</td>
</tr>
<tr>
<td>ESL</td>
<td>English as a second language</td>
</tr>
<tr>
<td>CD-I</td>
<td>Compact Disc Interactive</td>
</tr>
<tr>
<td>PEAC</td>
<td>Primary Extension and Challenge</td>
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<tr>
<td>VCR</td>
<td>Video Cassette Recorder</td>
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<td>NT</td>
<td>Northern Territory</td>
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<td>WA</td>
<td>Western Australia</td>
</tr>
<tr>
<td>DEET</td>
<td>Department of Employment Education and Training</td>
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