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Can we Leave it to Chance? New Learning Technologies and the Problem of Professional Competence

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This paper describes two different university and school collaborations featuring teachers' and students' use of online environments. The first example involves a classroom application of a Learning Management System (LMS) to deliver a Year 8 Studies of Society Unit on 'Rainforests'. This example serves to capture, bracket and examine the ways in which teachers have begun to redefine teaching practice, and to document the ways in which students experience this change in teaching. The second example documents feedback from a formal hands-on professional development program for teachers where follow up support was offered on-line, using the same LMS.

Data presented here suggest that the on-line environment is not a panacea for better teaching and learning outcomes. Example one identifies the means by which the on-line environment is able to stimulate effective learning exchange, yet signposts to the teacher the ways in which the emerging ICT classroom will challenge the technology, logistics, organisation and delivery competencies of many teachers. In example two, technology is painted as a catalyst to other elements of school reform. In both examples, the value of the on-line environment lies in its capacity to enable our collaborative knowledge about teaching and learning to interact so that each becomes a structuring, and constitutive resource for the other.

ICT in the classroom, online teaching and learning, university-school collaboration

INTRODUCTION AND THEORETICAL FRAMEWORK: BRINGING TEACHERS AND ICT TOGETHER

Recent Australian state and federal policy reforms include high priority initiatives aimed at improving the effectiveness of ICT use in classrooms. The Commonwealth Department of Education, Training and Youth Affairs defines Information Communication Technology (ICT) as relating "to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity" (Toomey, 2001, p.1). The addition of 'communication' to previous terms such as information technology (IT) emphasises the growing importance attributed to the communication aspects of new technologies.

The Commonwealth government has funded a major project "*Models of Teacher Professional Development for the Integration of ICT into Classroom Practice*", Downs et al. (2001) along with a separate project to investigate ICT competency standards for teachers with a view to developing national standards. The *Ramsey Report* (2000) advocated closer links between universities and schools to improve pre-service and teacher professional development. Furthermore, the *National Quality Teacher Project* (2001, p.3) supports these themes and outlines initiatives involving "the provision of teacher school-based professional development, attainment of national … and international recognised qualifications, and the development of curriculum and system support materials, both on-line and in hard copy". The importance of online learning in these plans is underscored by the report's claim (2001, p.3) that "the project will focus on good practice in online teaching and facilitate discussion on how online learners can be supported".

In Queensland, the recently formed Learning and Development Foundation (2002) claims that "on-line learning is a key component of teacher learning throughout Education Queensland", and has funded initiatives (including the present study) to investigate the use of online learning environments to support teacher professional development in ICT. The foundation is committed to improving and updating the skills of teachers in priority areas and not surprisingly, ICT heads the list of priority areas on their website. Collaboration with other partners is emphasised by the foundation's argument that "building relationships with new and varying stakeholders will be critical for optimal organisational performance" (online). The projects outlined in this article involve several of these identified priority areas:

- Enhancing teacher professional development in ICT

- Trialing innovative use of online environments and learning management systems for teachers and students, and;

- Forming partnerships between tertiary education providers, educational authorities, teachers and students

The development described above do not necessarily suggest that a consensus exists around the current priorities of governments, educational authorities and schools to provide teachers with more professional development in ICT. Perhaps the most influential critic of this strategy has been Cuban (2000) who has strongly argued that a lack of technical skills is not holding back the effective integration of computers in the school curriculum. Becker (2000, p.7), however, examined national US data from more than 4000 teachers across 1100 schools and strongly concluded that lack of technical skills was significantly holding back the development of effective classroom practice involving ICT such that

> … teachers who have a reasonable amount of technical skill and who use computers to address their own professional needs use computers in broader and more sophisticated ways with students than teachers who have limited technical skills and no personal investment in using technology themselves. (Becker 2000, p.7)

Furthermore Becker and Riel (2001, p.2) found that the more extensively involved teachers were in professional activities, the more likely they were to:

1. have teaching philosophies compatible with constructivist learning theory;

2. teach in ways consistent with a constructivist philosophy, and;

3. use computers more and in exemplary ways.

Their findings also indicated that teachers who were more engaged in professional development had students who often used computers in their classrooms to communicate with people outside the boundaries of the school, to analyse data and to work collaboratively

and were less likely to use computers for purely developing computer skills or engaging in drill and practice activities.

Teachers' capacity (henceforth referred to as teacher bandwidth) to use computers in classrooms is not in keeping with the increasing levels and opportunities available to access and appropriate constantly changing technologies (Sandholtz, 2001). A comprehensive study *'Teachers and Technology: Making the Connection'* cites lack of teacher preparation as a major obstacle to the effective use of technology in classrooms. In the US, a meagre 20 per cent of teachers felt that they were feeling well prepared to integrate technology into their teaching (NCES, 1999). In Australia, Queensland teachers have identified a lack of professional development as a major stumbling block to effective educational use of ICT, and have expressed the view that the lack of funds available made hardware acquisition a higher priority than professional development (Anderson, 1999).

Given that the literature clearly supports increased efforts towards providing teachers with effective professional development in ICT, the next question that needs to be asked is 'How does online learning contribute to the need for an increased focus on professional development and how can it contribute to enhancing and extending the traditional models of delivery?' Piguet and Peraya (2000) point out "there are numerous authoring tools that have broadened the base of possible instructional developers and allowed non-programmers, especially teachers, to create their own instructional learning environments" (p.302). Wilson (1995, p.302, cited in Piquet and Peraya) defines common LMS (Learning Management Systems) functionalities as "integrating all of the well established advantages of the world wide web … [and] as a place where learners may work together and support each other as they use a variety of tools and information resources in their pursuit of learning goals and problem solving activities".

Bohnenkamp and McMahon (2001) cite a recent trial in Indianapolis using *'Oncourse'* as the web based learning environment involving over 3000 teachers in a combination of face-to-face sessions and online modules to provide professional development in ICT. Although more data are needed to demonstrate the successful claims of the '*CLICK*' program, the authors conclude that:

> after participating in this unique online experience where curriculum is driving the technology, teachers have begun to redefine their role, as well as the role of the technology. *CLICK* combines the very best professional development with the latest technology to allow teachers to learn at their own pace, with plenty of support, in a collegial environment where they have access to a wide range of instructional resources. (Bohnenkamp and McMahon 2001, p.3)

To this end, staff at James Cook University and Education Queensland identified two local opportunities to improve pre-service and teacher professional development through collaborative efforts. These two different scenarios involving teachers' and students' use of online environments are described in this paper. The first example involves classroom use of a LMS to complete a year 8 Studies of Society Unit on Rainforests. It is used in this context to capture, bracket and examine the ways in which teachers have begun to redefine their role, and to document the ways in which students experience this change in teaching. The second example involves feedback from a formal hands-on professional development program for teachers with follow up support offered through an on-line LMS. This second case study is currently being implemented, so in many ways it remains a 'work in progress'.

EXAMPLE ONE: YEAR EIGHTS STUDYING RAINFORESTS ON-LINE

Aims and Focus of an On-line Pedagogy

The Year 8 Studies of Society and Environment (SOSE) textbook is (perhaps necessarily) an anthropological and theory-laden text, marked by what Callon (1986) terms 'obligatory'

passage points of discourse around what 'counts as social and environmental education'. Its treatment of the 'Rainforest' aims to enrol learners in its understanding of 'rainforest' issues, at the same time convincing them of the indispensability of existing (and at times ideological) solutions to 'rainforest' problems. This kind of textual engagement at some level obviates the need for the student to participate in the search for active solutions, perhaps to the extent that "knowledge is lifted out of practice" (Wenger, 1998, p.265). In this light, textbook teaching about rainforests does not necessarily cause learning; in fact much of what constitutes learning takes place without teaching, and indeed much teaching takes place without challenging learning. For its topical context alone, the 'Rainforest' unit provides a rich heuristic for introducing new (rich) teaching and learning technologies to support critical and 'productive' pedagogies.

The school involved was a large public secondary school close to the inner city area of Cairns, Queensland. The class of 33 students (mean age of 15 years) was asked to complete a five-week unit of study on "Rainforests". The 'Rainforests' unit was selected for on-line development because it already featured:

- facilitated peer-to-peer learning activities,

- cross-disciplinary collaborative interactions,

- situated problem-solving and;

- it provided the stimulus for learners to engage with a variety of learning resources, scenarios and climatic models.

A primary aim of the on-line environment was to extend the borders of the classroom to enable learners to have increased access to just-in-time information resources for simulations, group work and problem solving. A second aim was to enable interactions that promote a sense of belonging to a wider and *richer* learning environment than the immediate classroom. To the extent that teaching and learning are linked in practice, the linkage is not one of 'cause and effect' but one of 'resources and negotiation'. Unlike a classroom where everyone is learning the same thing, participants in an on-line learning community contribute in a variety of inter-dependent ways to the learning of the community and to engaging others through that learning. The value of an on-line pedagogy lies in its capacity to enable teaching and learning about 'Rainforests' to interact so that each becomes a structuring resource for the other. For this reason, the 'Rainforests' site paid particular attention to encouraging the learner out of the passive, and into an interactive mode of learning. This involved building pedagogical steps between:

- Student Prior Learning (Pre-learning Requirements)

- Learning Outcomes for each module of study (Knowledge Sourcing)

- Frequently Occurring Misunderstandings (Knowledge Sharing)

- Learning Tasks – Awareness Tasks to Promote Real World Issues; Puzzle Tasks to Challenge Existing Learning; Revision Tasks – what Gilbert (1962) termed 'Backward Chaining'; Problem-solving Tasks, and Reconciliation Tasks as a Means of Integrating Awareness, Puzzles, Prior Learning and Problem-solving.

- Subject Feedback Processes (Knowledge Dissemination)

Time Zones in a Rainforest

The first sign that something 'different' had happened in the classroom was that the five-week unit was much shorter than anticipated. In fact, the teacher completed it in two weeks, most of the student groups in three, and one group of boys failed to conclude it in five weeks. The class was both divided and together in its on-line experience of learning about

'Rainforests'. Not only did it separate students/teachers and student/student in 'learning *time and space'*, but the on-line medium also pointed out that 'learning' time does not align with 'teaching' time, and that learner perceptions of both are a powerful influence on learning experience and outcomes.

Learning Design and Architecture

The on-line 'Rainforest' environment is heavily constructivist: the aim of its design to stimulate candidate membership by recruiting learners *vis-a-vis* Wenger's (1998, p.270) three component design infrastructure of '*engagement, imagination* and *alignment'*. The learning architecture provided by a learning management system supports Wenger's (1998) thesis by providing pedagogical applications for:

- Communication suites/tools/places to promote and expand asynchronous engagement.

- Web-mounted materials and experiences (i.e. *Virtual Amazon tour*) by which learners construct an image of themselves in their world that is 'issues-based' rather than 'time-table' or teacher-centric.

- Simulations and interactions to 'practice' and 'form practices' about how to manage 'Rainforests', given the diversity of management issues to understand and consider.

The on-line environment presented in Figure 1 offers a variety of features and tools that can enhance the delivery of subject content materials and activities. These include a conferencing system, on-line chat, student progress tracking, group work organisers, student self-evaluation, grade maintenance, access control, navigation tools, auto-marked quizzes, e-mail, course calendar, student homepages, digital drop boxes and embedded search engines.

Figure 1. Rainforests On-line

The choices facing staff moving into an on-line teaching environment are daunting, and the 'technologies' broad. Initially, the magnitude of the pedagogical divide confronted teaching staff.

> *…we used to spend a week on this or a week on that and now they (students) are all over the place…I worry that they don't spend enough time on the important bits, and I'm buggered if I know how to test them. (Interview Teacher A)*

Teachers reported that the traditional teaching pyramid had '*been inverted'*, and felt at the '*bottom of the technological totem pole'*. Despite initial feelings of '*inadequacy',* by the end of the Rainforest unit classroom relations had significantly reformed as staff and students began to engage with (and transform) the learning resources. A new set of learning relations began to evolve.

> *We learned a lot... even about Rainforests, but mostly about how to learn. I would like to say we met on a level playing field, but the kids were way ahead of me. But (we) swapped ideas and traded skills and before long I was in about 12 discussion groups, and was able to start pointing and linking these together. The silence in the classroom was deafening ...the noise in the discussion boards was huge. ...I wondered how these things stop but then remembered we still have the bell thank God. (Interview Teacher A)*

Capturing What Students had to Say

When a classroom teacher states that we '*learned a lot … but mostly about how to learn*', we were intrigued to know more about the nature of this learning, how it is (re)distributed within this particular classroom, and what kind of pedagogical costs or benefits accrue. In keeping with virtual community protocols, an on-line survey featuring 20 items (a CGI form) was generated and posted to the subject web site.

A feature of the Rainforests unit was the host course management (LMS) software, which provided opportunities for embedding and networking collaborative learning groups. Learning group activities conducted over the scheduled five weeks engaged students in collaborative problem solving. On-line meetings consisted of sharing information, dissecting course materials, conducting environmental site analyses, collecting project data, collating project data, interpreting data, as well as publishing results from virtual field-trips and projects (eg: V*irtual Amazon*). The 'assessment task' for the unit involved students designing, developing and testing their own board game simulation that captured the "*Balance of the Rainforest*" as they understood it. Formative assessment involved a range of progressive on-line quizzes that often directed students to the archived and published work of other students as a point of contest and reference.

The Data: Learning In and Learning Through Technology

The results of the survey (Table 1) indicate that students endorse the on-line environment as a positive forum for learning. Reported learning transfer is high (85%), as is the reported increase in computer and communication tool skills (85%) and applications (88%), and the level of 'fun' experienced (91%). Clearly, participation in the learning activities of the 'Rainforests' unit requires negotiation of learning resources. Table 1 indicates a high level of acceptance of and for self-directed learning (82%), and self- (82%) as well as time-management (76%) opportunities. The Learning Management System records times that participants log in to the system and these data demonstrated that 90 per cent of the survey cohort accessed the learning resources outside of schedule class-time, indicating a readiness to extend (and in some ways challenge) the limitations of the 'timetabled classroom'. This finding provides strong evidence of engagement with, and acceptance of a new learning context, one that transcends learning beyond the pedagogical intentions of the school setting.

A climate of active learning exchange (73%) was evident between students and the embedded learning resources. These resources in turn promoted opportunities for learning to learn through both global and local materials and activities (77%), for the modelling of learning behaviours (85%), self-reflection and feedback (54%). Students reported a sense of involvement in realistic challenges that mediated their study of the environment, their interactions with peer group members, and the available ICT resources. Learning was not just confined to learning about technology, but encompassed learning in, and learning through technology. Feedback on aspects of member participation indicate an increased awareness of how 'my behaviour affected others' (73%), of the need to manage group processes (67%) and how to include and accommodate others (73%) in collaborative learning tasks. The online environment was clearly able to stimulate 'authentic' experiential and interpersonal challenges for students in a year eight SOSE course of study.

The 'identities of participation' that emerge through these classroom interactions point to a learning community that is closely connected by knowledge resources, whose membership is locally differentiated (by skill, exposure, preferences, proximity) yet remains locally connected through learning. In terms of induction to on-line learning, students labelled on-line modes of engagement as somewhat 'unorthodox' (52%) at first. Understandably, given the shift in the fundamental relations of the classroom, nearly half the students declared that they initially felt 'at risk' (45%) in this unfamiliar on-line environment.

Table 1. Summary Statistics – Student perspectives of On-line learning

Individual perspective	Agree		Disagree		Unsure/DK	
	N	(%)	N	(%)	N	(%)
Learnt a lot about Rainforests	28	[85]	2	[6]	3	[9]
Made new friends and connections	24	[73]	2	[6]	7	[21]
Improved my computer skills	28	[85]	0	[0]	5	[15]
Felt at risk at first	15	[45]	7	[21]	11	[34]
Found it easier to speak on-line in a group	26	[79]	5	[15]	2	[6]
Learned a lot through the experiential exercises	28	[85]	0	[0]	5	[15]
Learnt to have confidence in other students	24	[73]	4	[12]	5	[15]
Learnt to use on-line communications	29	[88]	1	[3]	3	[9]
I took control of my own learning	27	[82]	3	[9]	3	[9]
I was able to relate materials to real world issues	25	[77]	5	[15]	3	[9]
I felt comfortable giving/receiving feedback	18	[54]	9	[28]	6	[18]
Group perspective						
Showed up immature students	16	[49]	10	[30]	7	[21]
Saw how my behaviour affects others	24	[73]	3	[9]	6	[18]
Fun	30	[91]	1	[3]	2	[6]
Learnt to include quiet people	24	[73]	3	[9]	6	[18]
The Rainforests Project						
Unorthodox/unusual way of learning	17	[52]	12	[36]	4	[12]
Learnt to manage learning	27	[82]	4	[12]	2	[6]
Learnt to manage myself	27	[82]	1	[3]	5	[15]
Learnt to manage others in group work	22	[67]	8	[24]	3	[9]
Forced me to manage my time	25	[76]	4	[12]	4	[12]

The feedback from students about their 'maiden' experience of on-line learning is glowing, and assigns a significant role to resource-based learning in the SOSE classroom of the future. GroupWare enabled easy transition between private and public spaces, shifting the learning focus from the macro (class) level to the micro (learning group) level. E-mail provided a conduit for one-on-one networking for the sharing of information with limited clusters of learners, and 'back channel' group discussion pages helped orchestrate the public space before students 'went' public with their work and/or ideas. As their study of Rainforests progressed, students settled into a pattern of web-site use built around the site functionalities. The mix of idea-sharing forums and tool-building projects fostered both casual classroom connections as well as facilitated learning outcomes. The combination of whole class, as well as small learner group gatherings created a balance between the comfort of teacher-centred interactions and the 'self-management' and 'self-pacing' students describe when working in a distributed learning environment.

The Teacher's View – Teaching Rainforests On-line

As educators we are traditionally encouraged to focus on creating structures, systems and roles within our classrooms that achieve relatively fixed (sometimes banded, sometimes hierarchical) goals that enable our students to fit well into other school-based or systemic structures and processes. To most teachers this challenge presents itself in the form of strategies and techniques for classroom management. Rainforests on-line brings to a focus the challenges facing teachers and students when interfacing between two 'delivery' and 'classroom' management contexts. Teachers in this study report a range of challenges in a variety of areas: technology, logistics, organisation and delivery (Dabbagh, 2001). What emerged from teacher observations was a sense of dissonance, a fragmentation of teaching practice across two conflicting platforms.

> *Two roles ... on the one hand me, the constructivist, the facilitator moving in and around the knowledge construction processes of the student. They expect me to be their peer, their mentor ... I am supposed to contribute equally to the subjective and unstructured as well as the structured discussion within the class. On the other hand a different me ... the assignment marker ... bringing the lower end of the class closer to the top end ... the expert who will ultimately be expected to pass judgment on the rigor of student work in the most objective way possible. This conflict means the roles have to be performed independently – this results in a huge increase in my workload. (Interview Teacher A)*

After analysing the 'activity' (read on-line chat) within the subject discussion board, over half the discussion threads were generated by the teacher, and more than 50 per cent of the total responses were directly attributable to the teacher. Most of the teacher's discussion threads were attempts to 'set the collaborative agenda' for the class, including setting up activities, assigning groups and indicating useful resources. As the Rainforests unit progressed, more and more of the teacher's on-line time was spent on 'weaving' the student discussions towards an outcome. In the words of the staff member involved, this was 'heavy reflective work', the 'essence' of good teaching.

> *One task had students using email to prepare and submit a summary report of their board game ... (you know) the final assessment piece for the unit. This created huge response pressures. Even the suggestion of 'email contact' raises the expectation that I am permanently on tap for feedback, and that feedback will be needed <u>yesterday</u> rather than today. Great! ... so one Monday I lose my spare period when I would normally send out emails and for the rest of the week I am apologising to kids for my tardiness. They got very clever ... "Hey Mr _____, I can't do this assignment until you have approved my concept". The system had turned on me ... it was (like) trial by media ... make that multi-media (hah).*
>
> *And then ... yes there is a then ... you (interviewer) told me to use the technology to work for me, you remember ... to copy and paste responses in email rather than type it all. So the kids start to compare my feedback comments ... and what do you know ... they accuse me of sending out the same rotten email. I have never felt more under the microscope. (Interview Teacher A)*

The conflict between face-to-face and on-line processes was marked. In the words of the teacher, "*its bread and butter practice to close a lesson by pulling together the key themes of a lesson*". The demands of new literacies and their synchronous and asynchronous properties shift the responsibility for mediating discussions (read directing learning) to the facilitator. As the same teacher concludes, "*closing an on-line discussion helped me to demonstrate effective modelling and synthesising strategies, but it took me far too long (time) to achieve this*".

The organisational and logistical aspects of on-line learning seemed also to challenge both the response capacity as well as the administrative 'mind-set' of the school. It was difficult to "*get a computer lab*", and even more difficult to "*break into the IT and multi-media tribes*" to secure server access and "*some form of ongoing help*". Assessment also appeared problematic in an on-line environment. The teacher felt compelled to be able to 'feedback'

to students and parents about the quality of each student's participation, but felt he lacked the 'repertoire' (read time and means) to determine;

> which student contributions actually enhanced on-line debates; who was original and who was responsive in discussions; how to deal with lurkers and non-participation, and how to educate about attribution of ideas and resources. In short ... I felt the collective was engaged seriously in learning but I found it hard to say the same for each individual. How do you report this to parents? (Interview Teacher A)

As to the degree to which technology added value to the classroom practices of this particular teacher, we must borrow on the experiences of 'Tina' as a measure.

> Tina _____ just talks a lot. She is incessant. In class I would speak to her all day everyday if she had her way. I added up all the words I had typed to her over the last four weeks ... about 1800 words. Stay with me ... I have a point. Now, if I speak at ... say 160 to 170 words a minute this means that in four weeks I have spoken to Tina for the equivalent of about 10 -12 minutes. You tell me ... is that enough? (Interview Teacher A)

The risk in over-focusing on the experiences of one on-line teacher is that we may tend to over-identify with a very singular and idiosyncratic episode of teaching, *vis-a-vis* a sample of one. On-line teaching is a transformative practice, and just as we change one variable in our teaching regime so must we come to reflect on the applicability of all aspects of our teaching. The fact remains that on-line teaching has lead this teacher to question a dual delivery model. Despite the glowing response from students about their short experience of ICT and resource-based learning, two enduring principles emerge for our more circumspect teacher.

- On-line teaching leads to an increase in teacher workload, and;

- It can also lead to dissatisfaction (or at least ambiguity) with the quality of the teaching experience.

Example Two: Teacher Professional Development Support

Twelve teachers from three separate inner city, public primary schools in Cairns, Queensland engaged in hands-on workshops involving software programs commonly used in public schools across all curriculum areas. The software programs were those included in the Microsoft Office suite including Microsoft FrontPage. Teachers engaged in this professional development trial also identified Hyperstudio and Inspiration as programs that they would like to use more frequently in their classrooms. Each school involved in the professional development belongs to a formal alliance of schools known as the 'Cairns Consortium of Schools', which constitutes a formal agreement between the schools to share resources and collaborate on important issues such as teacher professional development.

Holland (2001, p.2) argues that although skill based training of teachers in ICT is important "current best practices suggest that while staff development may begin with such training, it should move quickly beyond to efforts that support teachers' development as professionals involved in decision-making, inquiry, and leadership in classroom teaching". To this end, meetings were held with the Consortium coordinator, the teachers and staff from James Cook University to examine the features of a Learning Management System and to decide how the online environment could support the teachers' needs in furthering their knowledge of ICT with a view to effective classroom implementation. Orientation sessions with the LMS were considered by all participants to be an essential starting point to these decisions, a point confirmed by McVay-Lynch (2001) who concludes that orientation sessions have a significant positive impact on the successful use of online learning environments. Teachers participated in development sessions at the university that involved guided exploration of the initial professional development site. This site consisted of links to exemplary JCU

subject websites (with guest access enabled) and a link to '*Webucation*' – an on-line professional development module that features problem-based learning as a catalyst to designing, developing and publishing on-line learning resources.

After these orientation sessions and hands-on experience using the LMS, the participating teachers identified important priorities for a staff development site. These included:

- Online self paced modules for skill development in selected software packages that could be completed by teachers or students.

- Modules or links to information on learning theory associated with the successful use of ICT in classrooms.

- Examples of best practice from classrooms, including written accounts and files showing exemplary student work.

- Support for synchronous and asynchronous collaboration between participating teachers and students; and:

- Links to useful sites such as Education Queensland policy and curriculum documents on computers in classrooms.

Teachers regard a potential staff development site as a way of bringing together theory and practice – to create a link between professional development providers and real classroom situations, as well as enabling a greater degree of on-going dialogue, reflection and sharing between participants. The importance of online tools extending the time and place that interactions can occur has been emphasised by Barab, Thomas and Merrill (2001, p.3) who maintain that "a central conviction underlying our perspective is that learning is a social act best supported through collaborative interplay among human beings – an interplay that can be effectively supported through the use of these tools". The teachers in this case study agree, and emphasise the value they place on extending interactions that are often begun in face-to-face professional development workshops, only to be lost on return to the classroom. Currently, skill based modules for software programs identified by the teachers as important are under trial by the participants. Links to useful sites are being collated and informed by members of the consortium, and processes for identifying and displaying best practice are being refined. Tools for collaboration between the participants have been made available and teachers are experimenting with chat and threaded discussion boards.

Concerns expressed by consortium members reflect the comments of teachers involved in the pilot 'Rainforests' project, and the broader literature. There remains a perception that on-line learning environments are inherently disembodied in nature and lack an intuitive instructional quality (Peitenati, Giuli & Khaled, 2001); that there is often not enough synchronous communication (Wang & Newlin, 2001); that teachers and students often lack the experience with ICT to effectively use the embedded tools and features (Cooper, 2001), and that viruses are easily (and painfully) transmitted (Wilson, 2001). The positive nature of participant response in this study indicates that these problems need not be features of online learning environments, and that strategies can be found to ensure that online professional development can be a solution oriented catalyst for ongoing pedagogical change.

CONCLUSION – STRIKING A BALANCE

Although this study has limitations in that it involves a small, specific sample, it illustrates that on-line teaching and learning environments (LMS in this case) provide a context in which teaching practitioners can design a curriculum that can motivate students and help them towards personal and cognitive growth. However, this transformation will not happen if left to chance. Some training in the technology is necessary if teachers are to take

advantage of the vast and still expanding range of cyber resources. Institutional investment in computer hardware and software will not yield excellence in teaching without similar input into the funding of staff development in the necessary pedagogical skills. Herein lies the potential for collaborative efforts between schools and universities to further improve pre-teacher training and professional development opportunities to include ICT in teaching. Stenhouse (1975) reminds us that there can be no curriculum development without the development of teachers. Holland (2001, p.245) points to this momentum as the crest of the wave, arguing that "as technology changes the way that schools themselves are structured, efforts to meld innovation in instructional technology with best practice in teachers' professional development catalyses other elements of school reform".

Professional competence is therefore at the heart of the future for on-line teaching. Simply insisting that teachers develop 'rich tasks' with technological overtones will not of itself result in sound educational practice in an on-line environment. Teachers must also be able to reflect on practice, inside and outside the LMS if their students are to enjoy the benefits of emerging technologies. It may mean that the teacher (as per our teacher in example one) has to think deeply about both face-to-face and on-line practice as a dual delivery package. In many ways, this is the same level of demand we placed on the students and teachers who participated in this study, and on students who participate in on-line learning on a daily basis. In the first example cited, teachers and students recant transformative change in the learning culture of their classroom. In the second example, teachers reflect on the benefits and opportunities that emerge from staff development activities that draw on a dual mode of face-to-face and ICT enhanced delivery. Data presented from each of the projects described in this paper confirm that the transition to on-line teaching requires more than the development of new technical skills. As online learning moves from the domain of distance education to encompass all modes of educational delivery, future research needs to be targeted towards a thorough examination of teacher readiness and the effectiveness of teacher professional development.

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My Experience with Physics Education in East Timor

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For two years I worked in East Timor helping to develop the new nation's physics curriculum. Together with local teachers, I created a manual of hands-on lessons, solidified the pre-secondary and secondary (middle and high) school curriculum, conducted nation-wide training for physics teachers of pre-secondary and secondary schools and began a new physics department at the national university complete with basic lab courses.

physics, science, curriculum development, teacher training, third world

HISTORICAL CONTEXT FOR EDUCATION IN EAST TIMOR

For about 400 years Portugal ruled East Timor and ran colonial schools for a very small number of children from upper-class families. The quality of education was quite good in some of the schools, if stiff and formal. From 1975 to 1999, Indonesia occupied East Timor and the education system was run the same as in other parts of the sprawling nation. Most teachers and nearly all principals in East Timor's middle and high schools were imported from other parts of Indonesia. Many were not top quality, and few were highly motivated to educate East-Timorese children. As of 1999, there was only one East Timorese physics professor at the University of East Timor.

In 1999, Indonesia's government finally allowed the East Timorese to vote on whether they wanted independence, or to be an "autonomous" region within Indonesia. On August 30, 1999, the East Timorese came out in vast numbers, in the face of massive danger and intimidation from the Indonesian military and their militias, to vote 78.5 per cent in favour of independence. After the results were announced, the Indonesian military and their militias destroyed much of East Timor's infrastructure, killed thousands of East Timorese and forcibly deported close to 300,000 people, one-third of the population. After the destruction had run its course, the United Nations set up and led a transitional government that ended in May 2002. East Timor is now an independent nation.

Around 80 per cent of the schools in East Timor were destroyed or damaged in 1999. Nearly all former Indonesian teachers left their positions before the vote. Most current education leaders have little experience in administration. Today, not a single physics teacher in the middle and high schools in East Timor holds a four-year degree in physics, and some have never studied physics. There is a dire shortage of teachers for most technical subjects. The previous university physics professor died in the violence of 1999, and the university with its connected technical school was destroyed by fire.

Today, most of my students at university have huge gaps in their comprehension arising from the chaos and mediocrity of their middle- and high-school experience. Many of the concepts I teach at university are taught in upper level middle-school classes in the United States.

MY STORY

Starting Out

I came to East Timor in October 2000 with no firm plans for my occupation. My partner Pamela had work lined up, and we were convinced that I could find something useful to do. In the United States, I teach physics and had worked at the Exploratorium Teacher Institute in San Francisco in some capacity for several years leading up to my move to East Timor.

Upon arriving in East Timor, I set out ambitiously to learn the local lingua franca, Tetum. I found it to be an archaic language, with most modern words taken from Portuguese, the language of East Timor's first colonisers. Mixed with Tetum was Bahasa Indonesia, the language of East Timor's most recent occupiers. By learning parts of these three languages, I could soon make myself understood talking about science and mathematics.

In December 2000, I was granted a two-year fellowship from the Institute of Current World Affairs. This fellowship essentially allowed me to pursue my own interests, all (reasonable) expenses paid, while writing an informative newsletter to members of the Institute once a month. This opened up great opportunities for me: I could work where I wanted without needing a salary.

While continuing work on language skills (work that has continued until today), I found two places to put my efforts. The first was a well-organised Catholic high school in Baucau. I had previously met the headmaster priest, and in January 2001 I offered to work with the school's science and math teachers on various hands-on activities that could be carried out in their classrooms. I held training sessions with them once a week for several months during which time we conducted simple experiments in math, chemistry, biology, and physics. These hands-on lessons (called *pratika* in Tetum) were entirely new to these teachers. I found physics teachers who had never handled a magnet and biology teachers that had never made the connection between the curriculum they taught and the animal parts available for consumption (or experimentation) at the local market. My language skills began improving more rapidly in the course of preparing and delivering these lessons.

In April 2001, I also approached the East Timor National University (UNTIL) to see if I could be of use in its Faculty of Education. I found physics to be the subject most desperately in need of teachers, and signed up to teach hands-on physics lessons to first-year students in the math and biology departments, four classes every week until July. There was as yet no physics department.

It was a light workload, and I filled my days developing activities for future use. Good activities must have a close connection to local culture and life and use only the most readily available materials. My large repertoire of science and math activities from the United States was severely limited by availability of supplies in East Timor, and I began to search the streets, forests and garbage dumps to determine what was out there waiting to be used in an experiment. I found banana leaves, palm fronds, bamboo, rocks, and various seeds and leaves from the forest; candles, rubber bands, gum balls, balloons, marbles, food colouring, and tiny straws all for under ten cents at local shops; and limitless 1.5 litre water bottles and aluminium beer cans in garbage piles courtesy of the United Nations.

Here are some examples of the activities I came up with. Banana leaf spines have a smooth track down the centre, custom made for marbles to roll down. If you prop one up on a chair, you can release marbles from different heights and measure their velocity as they race across the floor, then compare kinetic and potential energy to see how much was lost to friction. You can make a one-wheeled, rubber band-powered car with cardboard, palm-fond spines, and an aluminium can. If you make it well, it will cross the whole room. If you measure the force given by the wound-up

rubber band before release, and the distance the car rolls, you can use a simple bit of calculus to determine the amount of energy it used. Trashed florescent light units have ballast inductors in them that consist of fine magnet wire that you can use to make electromagnets, motors, speakers and current meters. You can use your homemade current metre to measure the strength of a battery you make by filling an aluminium wok with salty water and vinegar and plunging in a chunk of charcoal from a fire. With three kebob sticks, you can make a model of the human arm and hand in order to demonstrate muscles, tendons, ligaments and the different types of joints at each bend. The standard lung model can be made with a bottle, balloon and plastic bag, and you can complement the experiment with a sheep's lung from the market: if you jam a straw into one of the main holes and blow, the whole thing inflates like a puffer fish.

I took these prototype activities directly to trial at both UNTIL and the Baucau Catholic high school. All in all, my students were overjoyed at the opportunity to learn directly from experience, rather than from texts or a lecture.

Making a Manual for Hands-on Lessons

Near the end of the semester Miguel Maia, the dean of UNTIL Education Faculty, asked me if I was writing down my activities for future reference. I wasn't, and he asked me if I could. I thought it was possible, and we discussed the idea of a manual for other teachers. I began writing drafts of activities following the format of the Exploratorium *Snackbook*: simple, clear directions, followed by a short explanation and a bit about the activity's connection to real life.

After a few months it became clear that I could write up several dozen activities and make a good-sized manual. I could include lessons about most major topics in the middle- and high-school physics curriculum. I knew I would need physics teachers for editors, and we found four that were interested. I began to meet with them once every two weeks to edit one or two lessons. First I'd do the activity with them, then we'd slog through the bad Tetum of my draft, together making decisions on how to explain things and which words to use for various concepts. These teachers were paid through UNTIL for their work.

I began recruiting any and all students interested in being models for a physics manual. I found plenty in various venues, and the manual became filled with local personalities demonstrating how to carry out the activities. I took digital photos and was soon learning more than I ever wanted to know about word processing and layout.

From my years at the Exploratorium Teacher Institute, I knew that if this book was to be successful, each activity needed to be tested by East Timorese teachers on East Timorese students. About that time I met Rui Belo, the head of curriculum in the East Timor Ministry of Education.[1] He was quite excited about the idea of the manual, and offered to put together a group of teachers to do the trials. He would invite several from each of the 13 districts of East Timor. In order to do this, we needed a bit of money for transportation and food for these teachers, as well as printing and photocopying of the lessons themselves. Maia and I wrote a proposal to AusAID, Australia's international aid agency, through a small-grants program they have. We got the funding, and ended up asking AusAID two more times for money to finish the project and print 800 manuals. In October 2001, I began giving two-day training sessions, in which the group of 30 or so teachers would do about eight activities and choose one to take back to their school. At their schools, they would try the lesson with their students and report back to me on their success or lack thereof. I taught these sessions every month or so for the next eight months. This group of teachers tried

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[1] The Ministry's full name is "East Timor Ministry of Education, Culture, Youth and Sport," and is the largest and best funded ministry in the government. By some accounts, it is also the most chaotic.

over 60 lessons, and together with other informal trials I arranged, each lesson in the manual was put to test. With information from these trials, many lessons were improved and two were scrapped completely.

When the trials, photos, and content editing was finished in May 2002, the *Manuál Lisaun Pratika Fizika* was sent to the National Linguistic Institute where several local linguists made corrections to standardise spelling and usage in Tetum. The Manual contains a glossary of technical terms listed in Tetum, Portuguese, Bahasa Indonesia, and English. Seventy-two experiments and over 500 photos appear in its 350 pages. It is the first technical book published in Tetum, and a step toward developing the language of Tetum for use in technical subjects. Appendix A presents a sample lesson.

A Physics Department at East Timor's National University

Jumping back a bit, during East Timor's 2001 school break – August and September – I was asked to participate in creating a physics department within the education faculty of UNTIL. I worked with the one teacher in the country with a bachelor's degree in physics, Teresinha Soares. She completed her degree in the year 2000, and was frankly not so interested in becoming the director and sole faculty member of the UNTIL physics department. But with sufficient prodding by higher-ups and colleagues, she rose to the occasion. We looked at various other universities' curricula, and designed a three-year curriculum specifically to produce future middle- and high-school physics teachers.

In October 2001, 60 students were accepted into the physics department. To date, they have no textbooks to use. Truth be told, most classes at UNTIL use no textbooks, because books are not readily available in East Timor, are expensive when one can find them and no public money has been budgeted for them. Teresinha teaches from her own books and the students spend a lot of time copying from what she writes on the board. Occasionally they put up money to photocopy her notes or textbook pages.[2] Nor does there exist any formal laboratory facility. I have taught lab classes for a year and a half using normal classrooms and cheap, ordinary articles.

Our physics students are slated to become teachers, but due to poor conditions in schools and moderate salaries, the best students will undoubtedly look for better jobs in organisations or other branches of government. I think a realistic prospect is probably 25 to 35 new, well-qualified physics teachers entering the nation's middle and high schools by October 2004. To make things worse, many of those resigned to teaching will attempt to get a position in Dili as opposed to returning to their home districts, leaving the remote schools to languish without qualified teachers.

Teacher Training as Problem Assessment

Mid-year 2001, I also got to know the Catholic Teacher Training College of Baucau. Marist Brothers, mostly from Australia, run the College and put on teacher-training courses in a number of subjects. The director, Brother Mark Paul, was very keen to begin offering courses in physics. He offered to procure a small set of materials that the teachers could haul back to their schools and use for carrying out hands-on physics lessons. He also offered to buy full sets of quality physics textbooks from Indonesia so that East-Timorese teachers would have a source of reference. I assisted him in this preparation and began giving full-week courses through the Catholic College in late 2001. I taught mostly prototype activities from the Manual-to-be. Teresinha worked with me during these sessions teaching theory and exercises related to the hands-on activities. At each session we would give out our so-called 'science kits' – a locally

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[2] Photocopies in East Timor run from five to ten cents a page, quite a high price compared to local salaries.

hand-made basket filled with class sets of simple science gear (prisms, magnets, lenses, tape measures, stopwatches, spring scales, scissors, tape, straws, etc.) – as well as the set of reference books, one to each school.

These courses proved to be invaluable for me to understand the situation in East Timor's schools. I solidified my initial feeling that what we were offering was valuable: inspiration for overworked teachers bored with teaching directly from the textbooks, a new pedagogy, additional knowledge and help understanding basic concepts, as well as the new gear and reference texts. More importantly though, I learned that what we were offering was insufficient. I became aware that four main problems prevented most teachers from carrying out the hands-on activities in their schools.

First, many of the schools had no security whatsoever. Schools were fortunate if they had received a new roof and classroom furniture after the destruction of 1999. Solid doors and windows were few and far between. Thus some of the kits we handed out, which contained many items tantalising to the average curious student, were soon ravaged. Second, most teachers were unable to make the connection between the concepts in the hands-on activities and the national syllabus for physics. Naturally, this connection existed, but it was beyond the capacity or confidence of most teachers to decide where to insert a given activity. Third, the national physics syllabus, carried over from Indonesia's education system, was bloated: too many topics for the time teachers were allotted to teach.[3] Teachers could find no time to offer interesting activities in the midst of spewing forth all the theory. Finally, and possibly most significant, the teachers were not required to do the activities. Ultimately, hands-on education requires more preparation, and any sort of new method requires courage and confidence. If not highly motivated and also not required, many teachers will opt for the familiar (and mostly ineffective) lecture.

Visions for Improvement

From this insight, I began to develop a vision of how physics education in East Timor could be improved. First of all, the national syllabus would need weeding: topics of lesser import would need to be cut out to leave more time for a few important ones as well as for hands-on activities. This trim syllabus, as well as the hands-on activities in the Manual-in-progress, would need to be linked directly to the textbooks currently in use. The new, doable national syllabus, including the hands-on activities, would then need to be required for all teachers. East Timor has decided to continue national examinations, an artefact of questionable value left over from Indonesia's education system, so these exams would need to include questions on topics in the syllabus, as well as each hands-on activity. Finally, each school would need to receive a science kit complete with all special materials necessary for each of the required hands-on activities. For security, a sturdy, lockable cabinet would need to be placed in each school.

All my experience in the United States and China has led me to be highly sceptical of standardised syllabi, required lessons, and the like. It was therefore a very difficult process for me to come to

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[3] I recognized this so called 'more is less' problem from my years in China. The primary function of China's national examination system is to select a tiny percentage of students – around three per cent in the mid nineties – to go on to university. Since standardized tests primarily check for information retention, the national syllabus has been loaded with an unbelievable amount of information. Chinese universities are filled with students with photographic memories while millions of critically thinking, practical-minded students fail to make it into college. Middle- and high-school teachers are stuck with the job of cramming enormous quantities of esoteric information down students' throats day after day, year after year. Students' interests, opinions and ideas have no value in the system, and are actually detrimental to 'success' as defined by the system.

the above conclusions. Won't such a rigid system stifle teachers' abilities to inspire their students? No, I realised, the current teachers of East Timor have such poor preparation for their current jobs that they need a solid structural base to work from, a clear path to tread. In addition, they need the motivation of a required syllabus. The syllabus must contain plenty of hands-on lessons with ample leeway for creative adjustment and fine-tuning to follow the interests of both student and teacher. Through the process of learning these required activities, teachers will become familiar with the methods of learning from observation, discovering physical principles directly from experimentation and using scientific method to deduce and prove concepts in the classroom. They will also begin to fill the gaps of their own understanding. In the future, the state will be able to give teachers freedom to develop and teach with their own activities, ideally linked to their own communities as well as to the standard body of physics knowledge. The syllabus I envisioned was a necessary first step.

Setting up the System

In January 2002, I asked Rui in the Ministry of Education who was working on the national physics curriculum. He groaned, said no one was and that it was increasingly difficult to get any teachers to come to the Ministry to work on curriculum because there was no money to pay stipends, or even transport. I proposed that I get a few good, interested teachers, pay their transport to and from our work sessions, and revamp the entire middle- and high-school syllabus. Rui agreed on the spot, and I went off to find five of the teachers I had noticed to be the sharpest among the group of teachers doing trials on the hands-on activities. Each lived near Dili, and each was more than willing. I arranged a few dollars each for transport each time we met. Together with Teresinha from UNTIL, we met six afternoons over the course of a couple months and pulled off a very thorough weeding job on the national syllabus as well as planting hands-on activities from the Manual, now nearly completed, among the various topics in the syllabus.

One thing I had noticed early on was that the physics textbook used at high-school level was of very poor quality. The curriculum group heartily agreed and I inquired of the director of primary and secondary education if it was possible to purchase new ones. He asked us to make a recommendation and he'd see what he could do. Since there is nothing resembling a book store in East Timor, we then went on a wild chase for textbooks: each teacher brought their own ragged volumes, ransacked their own school in search of odd, old ones and confiscated any that students brought to class. We were able to get examples from five different publishers in Indonesia.[4] Using phone numbers in these books, we called up each publisher (on my phone) and asked for a free, complete set. Remarkably, each publisher came through and shipped us a set within a month, and we were able to make a detailed comparison of each text's treatment of various topics. We chose the one that was best suited for East Timorese students, and wrote our recommendation back to the Director.

To make a long story longer, the Director sat on the recommendation for a month, approved it, sent it on to the Minister of Education himself who sat on it for several weeks, then wrote a preface for it (a requirement for any textbook coming from Indonesia) and sent it to the folks in the Ministry of Education Finance office, who wrote up a requisition order and sent it off to National Treasury. Treasury soon sent it back to Finance saying the funds were not available. Only then did the folks in Finance look at the Ministry of Education's budget, and sure enough, in the category of high-school supplies there was not nearly the US$90,000 required. This was all a bit

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[4] Though the official languages of East Timor are Tetum and Portugues, virtually no one under 40 speaks Portugues, and no science books exist in Tetum. Thus, middle and high schools use textbooks from Indonesia, and learn in Bahasa and Tetum, as well as their own local language.

disheartening, but fortunately a friend of a friend in AusAID offered to look at a proposal. I helped the Minister write a quick proposal for the funds and AusAID approved it within two weeks. The new texts are on their way.

And well they should be, since our curriculum group had written the national high-school syllabus around these hoped-for books. Now it looks like it will all work out.

Meanwhile, on the kit front, things were feverishly coming together. Grants from four different donors covered the creation of kits for all 150 middle and high schools in the nation.[5] I found money to be the least of my problems.[6] How does one procure 1,500 nylon graduated cylinders from East Timor? How does one find even a single source, let alone a reasonable price? How many shops in Dili does one have to visit before finding 1,500 mirrors? What if a foreign company requires payment before shipment and the donor requires shipment before payment? What happens when 1,000 multimetres show up different from the ones ordered? This logistical nightmare occupied me for the better part of five months in early 2002. The Science Kit is presented in Appendix B.

Various vendors from Indonesia and Australia eventually supplied the items not available off-the-shelf in Dili. The gear seeped slowly in through customs and was stacked in the Ministry's storeroom. I then paid various neighbour kids to help me divide the mountain of equipment into class sets and pack them into rice bags (donated by World Food Program) in preparation for delivery to the schools.

Teacher Training as Launching of New Curriculum

At this point, the only element missing was training the teachers. For teachers so new to the pedagogy, good training was going to be crucial. Of course, how to teach with hands-on lessons is best learned by means of doing hands-on lessons. I found that Manuela Gusmao in the National Teacher Training Centre had no funds or staff to carry out the training. I told Brother Mark of the Catholic College about the situation and he stepped up to fund and administer the training courses. It was more complicated than that, however. The kit was necessary to teach the national curriculum, so training would be required for all teachers. Thus, we couldn't just invite interested teachers; we had to make it mandatory. For this to happen, we had to work closely with the Ministry of Education.

Working closely with the Ministry of Education is like working closely with a nice, but utterly senile grandparent. Every step requires assistance, prodding, kind reminders, fond threats, long repetitive discussions. Every activity must be rechecked to be sure it went in the desired direction. Himalayan patience is a daily requirement and outside psychological support is helpful. To make it even harder, in the middle of our operation the United Nations transitional government shut down and East Timor became an independent nation. This was a good thing, don't get me wrong, but the United Nations also pulled out a lot of the logistical support they had been giving to the half-island, especially communication and transportation. So it is that at the time of our trainings, we still didn't know exactly how many physics teachers there are in each district, how many never

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[5] Many times during this process I thanked my lucky stars that this nation is so small. The problems here of communication, transportation, bureaucracy and lack of experience are all so overwhelming that it is a breath of fresh air to find the numbers involved in any given operation so small. With a population of around 800,000, East Timor is about the size of San Francisco.)

[6] Before I came to East Timor, I knew nothing about donors and fund-raising. I still know nothing – the funds I was able to raise came to me by way of chance aquaintances and instances of bizarre happenstance. All my attempts at methodical searching led to naught. In the end we used US$157,000, including the new high-school textbooks, and not counting several thousand contributed by the Catholic College of Baucau through its programs.

received information about our courses nor how many received the information but were unable to find transport to attend.

By the time we were developing the national training courses, I could see the end of my stay in East Timor. I wanted to prepare people to take my place when I was gone, so I asked Brother Mark if he would fund the training of trainers. He agreed, as did the five teachers I had been working with to develop the syllabus. We met several times and I attempted to pass to them what I know about the art of teacher training. We also planned the courses together, choosing and reviewing lessons from the Manual to present and deciding which concepts were most important. Our goals were three: a) teachers carry out the activities and learn from them; b) teachers learn how to teach with hands-on activities; and c) teachers increase their understanding of various physics concepts.

At the first national training course in June, my trainer mentees were on the front line. I sat in the back and watched while they carried out the training of their peers. From time to time I would step in and make corrections or add things they had missed. All in all it worked well, and by the end of two courses, we had reduced the number of trainers necessary to two, plus Teresinha to work some exercises with the teachers and me as on-call mentor, now reading (and writing newsletters!) in the back of the room.

These courses were intense: Monday through Saturday, 8am to 9pm, with short breaks for food and bathing. We had divided the nation into four sections and conducted these courses in four central locations throughout the country. Twice they were held in a high school with teachers sleeping on grass mats at night in a bare classroom, eating in another classroom and bathing in the squalid school toilets. We offered no entertainment beyond the experiments themselves (which were often quite entertaining, mind you).

Nevertheless, the teachers' response was spectacular.[7] They showed up on time, stayed awake and never complained about the conditions. Only six schools in the nation failed to send teachers. A few teachers travelled to other regions to participate more than once. Nearly all wanted more! (And the reality is, they need more. In our weeklong course, we carried out only 23 lessons touching on most major topic areas, and quickly demonstrated about ten more. There are 41 required hands-on lessons for middle schools and 44 for high schools.)

Personally, I must say it was a non-stop thrill to watch group after group of teachers perform the simple activities, then become engrossed in genuine discussions about what they observed and its meaning. One by one they discovered that their subject is not just a set of isolated factoids, and is in fact tightly woven into the everyday lives of themselves and their students. Seeing them make these realisations was like witnessing the spring thaw.

We gave a total of six courses in four months. At the end of each course, we had the pleasant job of handing out a set of reference texts, the new *Manuál* for teaching hands-on lessons and a complete kit of gear for the teachers to take back and put in their newly delivered cabinet.

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[7] The Catholic College of Baucau has a policy of charging for its courses. The theory is that teachers paying for the courses will be more serious. Teachers were charged US$10 a piece for this 55 hour course. This money did not even cover their food for the week, but was still a steep price considering their US$150 monthly salaries. Some teachers complained about the price, and we discussed this issue at length, in part because this course was a national requirement. In the end a compromise was reached: teachers could attend the course for free, but if they wanted the certificate to prove they had completed the course, they needed to pay. The Catholic College paid for teachers' transport to and from the courses. I'm personally not satisfied that the compromise was adequate, but the trainings to date have been successful beyond my expectations.

Watching the happy teachers walk away with their loot at the end of an exhausting week reminded me of the summer camps of my youth.

The Situation I Left in East Timor

I departed East Timor in November, leaving vacant my place teaching the UNTIL lab courses. UNTIL needs a lot of support to develop proper laboratories for biology, chemistry and physics. Until this happens, our plan is to use lessons from the *Manuál* as the lab curriculum. My mentee teachers, as the most qualified lab teachers in the country, have each chosen a lab course to teach in the coming school year. Before leaving, I helped them develop the activities to a higher level, and take advantage of some of the equipment we found in dusty boxes left over from Indonesian times. For the next two years this should be adequate. After that, high-school students entering UNTIL will have already seen many of the activities and will need more rigorous lab courses.

As it stands today, the problems with physics education in East Timor are broad and various: General chaos at the Ministry level, and no science and math coordinator. Many teachers at elementary level completely avoiding science education. No proper lab facilities in middle- or high-schools. Most teachers with poor preparation, not enough teachers and few rising up to fill in the gaps. At university level, no laboratory, no books, only one moderately qualified teacher and no international help forthcoming.

At the same time, physics teachers in East Timor go to school and teach classrooms full of students everyday. Now many have some ideas about how to carry out hands-on education. They have a manual to give them step-by-step directions for some activities, a bit of gear locked in a cabinet to use for these activities, textbooks of tolerable quality, a set of reference texts and a national syllabus that is reasonable and gives them space to be creative. In short, middle- and high-school physics teachers in East Timor are equipped, required and generally inspired to begin working out how to teach with a method new to them, a method that puts great value on students' observations and on their culture and daily lives.

These teachers, however, are not satisfied. They have created the *Forum Komunikasaun Mestre/a Fizika Timor Lorosa'e*, an organisation devoted to further development of East Timor's physics curriculum. (Incidentally, the *Forum* is looking for funding, primarily for teachers' transport and photocopying. If you have ideas, please contact me via email at cake@exploratorium.edu.) I have every reason to believe that the state of physics education in East Timor will continue to improve after I'm long forgotten.

PHYSICS PHOTOS

If you skewer a guava on a nail, you can paint the equator on its waste and insert a pin, the head of which will represent the island of Timor. A gumball skewered on another nail will represent the moon. Both nails can be stuck into a banana leaf spine, and when you hold this fully rotating and orbiting apparatus under the sun, you can demonstrate day and night, seasons, moon phases and eclipses. Here, our neighbour Zeze models a solar eclipse on Timor.

Playing guitar could be East Timor's national pastime. If you bite a guitar as it is strummed, you can learn something about where the sound comes from.

Why is this boat floating? East Timorese students can do Archimedes' experiment to find out more about this integral element of Timorese culture.

Making and playing a bamboo slide whistle gives great insight into the concepts of frequency, wavelength and resonance.

Believe it or not, this old woman knows all about angular momentum and inertia. The fat, heavy bottom on her spinning rod is not just for looks.
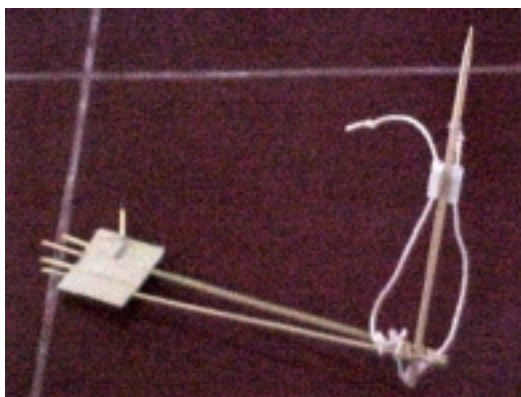
A prerequisite for the model-arm activity is to eat three kebabs.

Our 12-year-old neighbour Ana understands why pressure increases as you go deeper in the ocean or the atmosphere.

With aluminium foil from a box of clove cigarettes and a couple of batteries pilfered from the family flashlight you can illustrate the principle of a fuse.

What happens if you turn on your radio then stick it in a pot and put on the lid? Try it!

A couple of crackers and some rice porridge make a model of plate tectonics that you can use to explain earthquakes and nearby volcanoes. The model can be eaten when you're done.

Some of the 150 kits we distributed.

Nuno, one of the trainers-in-training, giving directions for an activity on Archimedes' principle.

Marcal from Aileu district displaying his kit.

A group of teachers thinking hard about atmospheric pressure.

APPENDIX A: SAMPLE LESSON
FROM THE MANUÁL *LISAUN PRÁTIKA FÍZIKA*

This lesson's name means "Winnowing Rice." The concept is that dense, compact things will move more easily through a fluid, such as air, than things with large surface areas. This principle is used to winnow grain, and is key to life in East Timor in that most people winnow rice daily to remove hulls and other foreign objects before preparing it to eat. It is also the principle behind a simple toy that can be made from string, a stick and plastic sack cut into a long strip.

The sections are standard to each activity in the Manual: **Supplies The Student Will Bring, Supplies The Teacher Will Bring, Group Size, To Do It, What Happened, Connection To Life, Connection to Textbook**.

TAHEK FOOS

Hadulas tali, ai no plástiku ikun atu komprende oinsá halo ketak foos nia isin no kulit.

Sasán ne'ebé estudante atu lori:	Sasán ne'ebé mestre atu lori:
• ai baluk	• tali
• plástiku	• tezoura

Tamañu grupu nian: konforme – estudante ida-idak bele halo mesak

Atu halo:

1. Tesi plástiku lotuk no naruk hanesan metru ida ka rua. Mós, bele uza tali rafia.

2. Kesi plástiku ba ai, no mós kesi tali ba ai.

3. Ba li'ur, kaer tali no hadulas hanesan foto iha kraik. Haree sá mak mosu.

4. Fila ba sala no halo diskusaun kona-ba sá mak mosu.

Sá mak mosu?

Tanbasá tali loos de'it maibé plástiku halo forma hanesan kabuar? Tanbasá ai sempre ba primeiru no plástiku tuir?

Atu komprende esperimentu ne'e, tenke hanoin kona-ba anin. Ai, tali, no plástiku semo iha anin nia laran. Anin fó forsa [gaya] ba sira. Forsa ne'e naran forsa friksaun [gaya gesekan] anin nian. Forsa ne'e sempre ba iha diresaun opostu ba sira nia diresaun semo.

Forsa friksaun anin ba buat ruma depende ba anin hira hasoru ho buat ne'e. Hanoin uluk kona-ba tali. Tali lotuk liu no hasoru ho anin uitoan de'it. Tuirmai hanoin kona-ba ai. Ai boot liu tali, maibé sei ladún boot. Ai hasoru ho anin ladún barak. Agora hanoin kona-ba plástiku. Plástiku boot liu – uluk ita tesi nia, nia boot hanesan saku plástiku. Nune'e, nia hasoru malu ho anin barak liu. Ne'e duni, forsa friksaun anin nian boot liu dudu ba plástiku.

Entre tali, ai, no plástiku, ai todan liu. Tanba ne'e, nia iha enerjia barak liu atu hasoru ho anin, no dudu anin. Plástiku no tali kamaan, no la iha enerjia barak atu dudu anin.

Mestre bele halo demonstrasaun balu atu hatudu ba estudante sira sá mak mosu bainhira troka tali, ai, no plástiku.

- Hakotu plástiku no hadulas ai iha tali de'it. Haree sá mak mosu.

- Hasai ai husi tali no hadulas tali de'it. Haree sá mak mosu.

- Kesi plástiku diretamente ba tali no hadulas tali. Haree sá mak mosu.

Se anin la iha, esperimentu ne'e sei sai la hanesan. Tuir teoria, tali, ai, no plástiku bele dulas loos de'it. Mós, bele halo esperimentu ne'e iha bee nia laran – iha tasi nia laran. Sá mak sei mosu? (Forsa friksaun bee nian boot liu forsa friksaun anin nian.)

Ligasaun ba moris:

Esperimentu ne'e importante tebes ba ita nia lororon nia moris. Ita uza konseitu ne'e atu hasai foos nia kulit husi ninia isin depois fai hare. Bainhira ema tahek foos, foos nia isin no kulit sa'e ba leten. Tanba forsa gravidade, sira mós tun fali. Foos nia kulit boot no hasoru ho anin barak – nia tun neineik. Foos nia isin kiik no todan – nia tun lalais. Tanba forsa friksaun anin nian, ema bele halo ketak foos nia isin no kulit. (Atu hetan informasaun tan, haree lisaun "Galileo.")

Lisaun ne'e liga ba:

Eskola Pre-sekundária Livru Testu Fízika 1B, Konsep 5, p. 20.

Eskola Sekundária Livru Testu Fízika 1A, Bab II, p. 43, no mós 3A, Bab II, p. 1

APPENDIX B: THE SCIENCE KIT

Each middle and high school in East Timor will receive the following list of supplies. Together with the cabinet, the cost per kit came out to US$380. Two-thirds of the activities in the Manual use only items that students can find, bring from home or buy for less than ten cents. Just one-third use special materials.

Item	Quantity	Item	Quantity
Compass, magnetic	10	Speaker	1
Diffraction cloth	10 pieces	Speaker plugs	5
Electrical components	10, 6 kinds	Spring scale, 5 newtons	10
Food coloring, powder	1 pack	Stopwatch	10
Glue	3 bottles	Straws	6 packs
Graduated cylinder, 500 ml	10	String, cotton	3 rolls
Hand lens	10	String, plastic packing	1 roll
Knife	1	Syringe, 10 ml	10
Light bulbs, 3V	100	Tape measure, 1.5 meters	10
Magnet, large	1	Tape, masking	6 rolls
Magnet, small	60	Tape, packing	2 rolls
Mirror	10	Thermometer	10
Multimeter	10	Thread	3 rolls
Nails	1/2 kg	Transformer	1
Prism	10	Translucent plastic bags (for optics)	7 packs
Protractor	10	Tubing	3 meters
Ruler	40	Used disposable camera	1
Scissors	10	Wire, connection	6 meters
Screwdriver, Philips	1	Wire, magnet	200 meters
Slinky	1		

I managed to have the cabinets made by a group of local carpenters and coax the Ministry's lumbering logistics unit into hauling them off to each individual school in the farthest corners of this nation of treacherous mountain roads. This also took several months of patience and persistence, with gifts and sweet-talking to all sides.

Western Influences in Korean Preschool Education

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This study examines Korean preschool education under Western influence. At the macrosystem level, we explore the historical and philosophical background of Korean preschool education. At the microsystem level, we examine how Western influence has affected preschool educators' perceptions, daily practice and the curriculum in preschool settings in Korea. This study shows that there were discrepancies between Korean teachers' practices and their beliefs which are mainly from Western philosophies. Despite a child centred Korean National Curriculum and the teachers' beliefs, the actual practices in the preschools are significantly different from child-centred philosophies. This discrepancy between beliefs and practices could be explained by several factors such as the reflection of traditional Korean values and the low adult to child ratio. This study suggests that any educational system reflects the cultural values of the society which implement it and preschool education is situated within a specific cultural context. Thus when we adopt some lessons from other countries' theories and practices, we should be conscious of considering its appropriateness for the particular context of a particular country.

Westernisation, Korea, preschool education, curriculum, traditional values

INTRODUCTION

Korea is located in the Far Eastern part of the Asian continent, surrounded by sea on three sides, bordered by Russia and China, and Japan across the sea. Korea is an East Asian country in which Confucianism has been deeply embedded in the whole society. The traditional Korean education system, influenced by Confucianism, is defined as teacher-directed, with an emphasis on cognitive development and a highly competitive examination system. Modern early childhood education in Korea was initiated by Japanese educators in 1897. The Japanese influence is reflected in the use of structured play, whole class teaching and an expectation of uniformity in the children's behaviour. However, under the influence of Western society, Korean preschools have adopted some of the techniques of open education, which emphasises children's individual interests and development.

The main aim of this study is to examine Korean preschool education under Western influence. The major questions to be addressed by this study are as follows: What are the historical and philosophical backgrounds that have influenced preschool education in Korea? How has Western influence affected preschool educators' perceptions of preschool education, daily practice and the curriculum in preschool settings in Korea.

Theoretical framework of the study

The theoretical framework of the present study is based on the ecological theory developed by Bronfenbrenner (1979), and focuses on the relationship between the child and society, stressing the importance of child rearing in its social context. According to Bronfenbrenner,

young children's lives are influenced by different levels of their ecological environment. The ecological environment is seen as composed of four interlocking structured levels, including the most immediate settings such as home, school and work, and the interaction between these immediate settings and larger social settings. With Bronfenbrenner's ecological theory that emphasises the importance of seeing child education in its social contexts, the study examines the macro and micro levels of preschool education in Korea through literature review, questionnaire and observation. At the macrosystem level, I explore the historical and philosophical background of preschool education and government policies. At the microsystem level, I explore preschool educators' perceptions of educational issues, preschool practices and early years curriculum in preschools in Korea.

Research Methods

This study employed a combination of quantitative and qualitative data gathering methods. The tools employed in this study include documentary analysis, questionnaire and observation. The questionnaire examined Korean preschool teachers' perceptions and practices. In the piloting process, 10 questionnaires were sent to early child educators in Korea. During this process some elements were added and changed. For the sample, in order to reflect the diversity of socio-economic backgrounds, I selected two different contrasting regional districts of Seoul. In the two regions of Seoul, there were 121 kindergartens (15 public kindergartens, and 106 private kindergartens). All the kindergartens were included in the sample. With 121 questionnaires sent out and 84 returned, a rate of 69 per cent was achieved.

The observations collected detailed information about daily practice, and the curriculum offered in the sample of preschool settings. For the observation sample, I selected six preschool settings ensuring variation across type and location of preschool settings. At that time, I spent one whole week in each of the six preschool settings. In this study, the observations were of two different kinds: qualitative observation and structured observation. While the unstructured qualitative observations focused on the contextual information, the structured observation was based on the time sampling method to examine the structure of lessons and the use of time in preschool classroom. The main procedure of these systematic observations is as follows:

1) four children in each setting were selected on a random basis from class lists ensuring a balance between boys and girls.

2) Each of the four target children was observed every 2 minutes throughout the 30 minutes period.

3) I followed a rotating sequence to ensure that all target children were observed on a regular basis.

DOCUMENTARY RESEARCH

Historical development of early childhood education in Korea

The foundation of early childhood education in Korea was introduced by Japanese educators and American missionaries. Since the introduction of the first kindergarten in 1897, various Western early childhood program models have been introduced in Korea. Froebelian methods were introduced during the Japanese colonial period by Japanese educators and American missionaries. According to Bailey and Lee (1992), the Japanese Froebelian method emphasised group activity and uniformity while American missionaries emphasised children's interests and every day activities. In the 1930s American missionaries introduced

Dewey's progressive approach to education which emphasized children's real life experiences. In the 1970s, the Montessori method was also introduced. According to Lee (1996), the Montessori movement has brought Montessori materials rather than Montessori principles to Korean preschool classrooms. Nowadays, many Korean preschools provide selected Montessori materials within a relatively unstructured sequence, not in a specified way. More recently Piaget's developmental theory has been introduced.

The Western influence has been a significant factor in the development of early childhood education in Korea. It is noteworthy that among Western influences on Korean preschool education, the American influence is profound. American Developmentally Appropriate Practices (DAP) has become the basis and the main reference for Korean early childhood education and the National kindergarten curriculum guidelines (Shim and Herwig, 1997). The guidelines are based on Piaget's theory of early childhood development, and advocate child-directed and play-oriented learning (Bredekamp, 1987). The guidelines list workbooks, worksheets, whole class teaching, use of authority and an emphasis on basic skills as inappropriate practices. The recent American influence on Korean preschool education is mainly due to Korean preschool specialists who studied in America, later transplanting their learning to Korean preschool practices (Lee, 1996). They introduced research trends, educational theories and classroom practices from an American context. In particular, they have influenced the national curriculum content and teaching method. There is some concern that Korean preschool specialists adopted western ideas in preschool practice without considering their appropriateness for the particular context of Korea (e.g. Lee, 1997). Table 1 summarises the Western authorities and their influence on Korean preschool education.

Table 1. Western influences on Korean preschool education

	Introduction	Main influence
Froebel	1890s	Emphasis on play & introduction of gifts, occupations
Dewey	1930s	Learning by doing and real life experience
Montessori	1970s	Children's spontaneous and independent learning & special Montessori apparatus
Piaget	1980s	Developmentalism
American DAP	1990s	Child-centred and play oriented
		(inappropriate programme – whole class teaching, use of authority, basic skill teaching, and work sheets etc.)

Traditional values in Korean preschool education

Korea is an East Asian country in which the Confucian legacy has been deeply rooted in the nation's guiding philosophy, influencing governmental structure, the educational system, and individual life. This study examines the impact of traditional values on Korean early years education, based on the three main principles of Confucianism: hierarchical human relationships, an emphasis on collectivism and an emphasis on academic achievement.

Confucianism places an emphasis on hierarchical human relationships. In a Confucian society, all human relationships are based on loyalty and obedience. In traditional Korean society, parents constantly taught their children to respect and obey their parents, teachers and elders. Thus, obedience and respect for teachers in the classroom has long been considered a virtue in Korean society. The acceptance of authority and respect for teachers has led to a teacher-centred educational tradition in which teachers exercise strong leadership and control; this tradition is still prevalent in the classroom.

Traditional Confucianism places more emphasis on the group interest than on the individual. According to McLean (1995), in a Confucian society, the individual person must restrain himself in order to maintain group harmony. Park and Kim (1999) contrast Confucianism with Western liberalism as follows:

> In Western societies, liberal moral-political values emphasize individuals' rights to freely choose their own goals. In contrast, Confucianism in East Asia emphasises collective good and harmony, coupled with self-cultivation and self-regulation (p.91).

Hofstede (1991) also distinguished the concepts of individualism and collectivism as an important dimension of cross cultural differences. He said that individualistic societies emphasize 'I' consciousness, autonomy, independence and individual initiatives. On the other hand, collective societies emphasize 'We' consciousness, collective identity, emotional dependence, group solidarity. He classified Western European and North American countries as individualistic countries, and East Asian societies as collectivistic countries. Tobin et al's (1989) study of 'Preschool in Three Culture' also contrasts the prevailing focus on the groups in Japanese and Chinese preschools with the individualism of those in the United States. The Japanese and Chinese, on the other hand, according to Tobin et al, emphasise the importance of treating children equally and give less emphasis to the needs of children as individuals.

In Confucian culture, education is considered invaluable as a means of cultivating a moral mind and maintaining the social order. The emphasis on academic learning and the use of competitive examinations has long motivated Koreans to pursue educational endeavours. It is frequently mentioned that the drive for education among Koreans is extremely strong. The emphasis on academic achievement and the competitive atmosphere exert a downward pressure even on preschool education. Recent research conducted by the Ministry of Education (source: Daily Chosun, 2002) reported that a survey of 2,159 parents with kindergarten children, showed that 86 per cent of Kindergarten children nationwide take extra curricular lessons after school. Having a high respect for education, Korean parents are very enthusiastic about their children's progress from an early age and try to give their children an early start for later academic success.

Early childhood curriculum in Korea

The Ministry of Education provides the National Kindergarten Curriculum for three to five year old children. The first National Kindergarten Curriculum was introduced in 1969 and has been revised five times. The emphasis on the current National Kindergarten Curriculum is child-centred, play oriented and an integrated teaching approach rather than learning academic skills. The main focus is on children's holistic development (MOE, 2001). The emphasis on the current Korean curriculum is similar to traditional child-centred early years principles. It is notable that the Korean National Curriculum does not require preschool children to have acquired academic skills in numeracy and literacy before starting compulsory schooling. The Korean Ministry of Education retains a governmental initiated inspection system. Korean kindergartens are inspected regularly once a year or every two years by Local Educational Authorities. Inspectors concentrate on verifying compliance to the governmental regulations and reviewing kindergarten documents rather than evaluating curriculum management and teaching methods (Kim, 2001). It is noticeable that the inspection result is not related to public funding because most Korean kindergartens are private, and wholly dependent on the parents' tuition fees.

EMPIRICAL STUDY IN KOREAN EARLY CHILDHOOD EDUCATION

Classroom characteristics

According to the questionnaire responses, most of the kindergarten classes had 30-34 children (46%); there were 24 per cent classes with 25-29 children and 10 per cent had over 35. The highest proportion of adult to child ratio was between 1:21 - 1:30 (42%), 32 per cent between 1:11-1:20 and 19 per cent of classes were from over 1:30. All six Korean kindergarten classes I observed consisted of 30 to 35 children taught by one teacher with or without a teacher's assistant (See Table 2).

Table 2. General Information about Korean kindergartens (n=84)

Number of children in a class	frequency	%	*Adult child ratio*	frequency	%
less than 15	-	-	up to 1:10	6	7.1
15 – 19	7	8.3	1:11 -1:20	27	32.1
20 – 24	10	11.9	1:21 - 1:30	35	41.7
25 – 29	20	23.8	1:31 - 1:40	15	17.9
30 – 34	39	46.4	over 1:40	1	1.2
35 – 40	3	3.6			
over 40	5	6.0			

Perceptions of early childhood educators

This section reports on that part of the questionnaire that examined the Korean preschool educators' perceptions of a number of controversial educational issues: developmentalism, children's intrinsic motivation, free play and structured play, attitudes towards 3Rs teaching and learning, and the role of preschool educators. In Table 3, statements 1, 2, 4, 5 and 9 are related to the child centred perspective, whereas statements 3, 6, 7 and 8 are related to the academic oriented perspective.

Table 3. Perceptions of kindergarten teachers in Korea (%) (n = 84)

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1) Children learn naturally through ordered stages, so it is no use hurrying them on to later stages.	10.7	56.0	16.7	14.3	2.4
2) All children have intrinsic motivation to learn.	35.7	34.5	17.9	8.3	3.6
3) Preschool educators should use competition, prizes and other rewards to motivate children.	2.4	48.8	23.8	13.1	11.9
4) Preschool children learn best through play which is self-chosen and self directed.	58.3	25.0	14.3	2.4	-
5) Preschool learning should not be separated into subjects, rather all subjects should be integrated.	44.0	25.0	21.4	8.3	1.2
6) Play time and work time should be clearly distinguished.	11.9	27.4	22.6	16.7	21.4
7) Preschool educators should use worksheets to help children learn maths and reading.	1.2	32.1	28.6	15.5	22.6
8) Preschool educators should use highly structured, adult directed lessons with small groups.	7.1	29.8	21.4	21.4	20.2
9) A preschool educator should be a facilitator rather than a direct instructor.	36.9	46.4	4.8	8.3	3.6

Developmentalism

Statement 1 asked Korean kindergarten teachers to indicate an opinion about a developmental approach to practice. Sixty-six per cent of Korean teachers agreed with statement 1 and 17 per cent responded negatively. This result shows that, as discussed earlier, Piaget's developmental theory has influenced Korean educational approaches and the majority of Korean preschool teachers support a developmental approach. All of the kindergarten teachers, and the 6 head teachers of the Korean preschools where I observed, advocated 'child-centred education' as the main aim of preschools. However, the observation data show that these expressions of intent are not always reflected in their practice.

Intrinsic motivation

To statement 2 that *"all children have intrinsic motivation to learn"*, 70 per cent Korean teachers responded affirmatively, while 12 per cent disagreed. The majority of Korean kindergarten teachers claimed to support the theory that children are naturally curious and motivated to learn, which may be a result of Western style teacher training. All six kindergarten teachers whom I interviewed emphasised educational values such as independence, creativity and learning through first hand experiences.

Extrinsic motivation

Interestingly, a majority of Korean teachers (51%) agreed with statement 3 that *"preschool educators should use competition, prizes and other rewards to motivate children"*. A possible reason for this high proportion could be that in a very competitive Korean educational environment, Korean teachers take for granted competition, prizes and rewards. During the observations in four of the six kindergartens I visited, there were many competitive group games and activities. Korean teachers use competition and rewards to motivate children during group games and activities. During the group games, children were cheering and shouting "Our team! Win! Win!".

Child directed play

Statement 4 is that *"preschool children learn best through play which is self-chosen and self directed"*. In response to the statement, the majority of the Korean teachers (83%) responded affirmatively. Although most of kindergarten teachers support child-chosen and child-directed activities, the observation data show that in terms of time spent on activities, sessions are mainly teacher directed rather than child directed.

Integrated learning

To statement 5 that "preschool learning should not be separated into subjects, rather all subjects should be integrated", 69 per cent of Korean teachers in the sample answered affirmatively, 21 per cent were neutral, and 9 per cent disagreed. All six Korean kindergartens I observed used integrated teaching plans with cross curicula teaching related to themes. However, as we shall see later, there were many separate periods of subject teaching which were not directly related to the topic.

Separating play time from work time

In response to statement 6, 39 per cent of Korean teachers agreed, 23 per cent were neutral, 38 per cent responded negatively. In three of the six preschool settings in Korea where I observed, there were clear distinctions between playtime and formal work time. Although

these kindergartens provided free play alongside formal learning through a thematic approach, they also made a clear distinction between play time and work time.

Worksheets

A third of the sample supported using worksheets, 29 per cent were neutral and 38 per cent disagreed. The interview data show that some teachers were highly critical of using worksheets because they thought that worksheets were not appropriate to young children's needs and development. However, three out of six Korean teachers whom I interviewed said they used worksheets as a complementary method to teach literacy and numeracy skills and science. In these kindergartens, children also took some worksheets home as homework.

Structured small group lessons

In statement 8, the teachers were asked about using highly structured small group lessons. Thirty-seven per cent of Korean teachers agreed with the statement, 21 per cent were neutral, and 42 per cent disagreed. In all six kindergartens where I observed, there were structured small group activities with an adult, such as literacy practice, science experiments and drama. However, more often the structured activities took place in the whole group context, rather than in small group time. Perhaps this is a consequence of the relatively low adult to child ratio, which makes small group activities with dominant teacher input hard to organise.

The role of the preschool educator

Eighty-three per cent of the Korean teachers agreed with the statement about the role of the preschool educator as facilitator. However, the observation data show that their ideal teacher's role is not always reflected in practice. In many cases, a Korean teacher's role is rather that of a designer of children's activities, and instructor.

The findings show that in terms of educational issues, this sample of Korean teachers responded very positively to the child-centred statements about developmentalism, children's intrinsic motivation, integrated learning and the child-centred role of teachers. However, at the same time they also supported extrinsic motivation, work sheets and separation of play time from work time, which are considered inappropriate in traditional Western early years education. The questionnaire responses indicated that the Korean teachers' perceptions were two fold and contradictory. One possible interpretation of this apparent contradiction could be that the Korean teachers' beliefs are a reflection of both their western style teacher training and the Korean social context in which preschool education actually takes place.

Classroom organisation

The Korean kindergarten teachers were asked about their classroom organisation. They were asked how frequently they used child directed activities, teacher directed small group activities and teacher directed whole class activities. Table 4 shows the data for classroom organisation in Korean kindergarten classrooms.

The responses to the questionnaire indicate that even though educators in Korean kindergarten staff claim to provide both child-directed activities and small group activities, they apparently more often provide whole class activities. Forty per cent of Korean teachers say they use whole class activities for more than half the session, and more than 90 per cent teach the whole class for at least 3 periods a day. Only 18 per cent reported using small group activities for more than half the session, while 30 per cent reported child-directed

activities occupied more than half the session. The higher proportion of whole class activities in the Korean kindergartens compared to the English preschools may be explained by the large size of class and low adult child ratio. Another reason could be the emphasis on group activity in the Korean educational tradition.

Table 4. Classroom organisation in Korean kindergartens (%)   (n = 84)

	Very frequently	Frequently	Sometimes	Seldom	Never
Child directed activities	29.8	31.0	33.3	6.0	-
Adult directed small group activities	17.9	57.1	25.0	-	-
Adult directed whole class activities	40.5	52.4	7.1	-	-

Very Frequently = over half the session; Frequently = 1-3 times/day; Sometimes = 1-3 times/week; Seldom = less than monthly

Adult directed activities

Teacher directed whole class activity is a distinguishing factor in Korean preschool classrooms. During whole class activities, Korean preschool teachers included various activities and materials, explanations and direct instruction. For instance, in one private kindergarten, the daily session lasted for 5 hours. I observed that children spent a large portion of their time (65%) on whole-class activities. During my observation, the kindergarten operated a highly structured curriculum with whole class activities based on the theme of the week ('air'). The teacher began the whole class activity first by leading nursery rhymes with finger play and talked about the date and the weather. She introduced children to what they would be doing during the session. During whole class activities, the teacher covered various aspects of the topic related to 'air', using poem, story, music and movement, art, watching a video and scientific experiments. The kindergarten teachers presented factual knowledge to children, both verbally and practically, that included the power of air, the weight of air, breathing, the growth of plants and burning objects. Table 5 shows a daily schedule for this kindergarten.

Table 5. Daily schedule in a Korean kindergarten

time	activity	contents
9.00	open/ free play	literacy, math, science, construction, role play, book corner, computer art table with a teacher
10.00	whole class activity (1)	singing & finger play, date, weather, discussion, poem science experiment (making air balloon rocket)
10.35	special activity of the day	English lesson (P.E or drama)
11.00	whole class activity (2)	snack, singing, art, watching a Video programme
12.00	lunch & outside free play	after lunch, outside play
1.20	whole class activity (3)	story, singing and nursery rhyme, review time
2.00	home time	

It is noticeable that despite the size of their classes, Korean teachers seemed to be accustomed to coping with whole-class instruction. During my observations, Korean teachers deployed various classroom management techniques in order to control their large classes. For instance, they emphasised the teacher's authority, reinforcing discipline and manners consistently. During the whole class activity in one classroom, a teacher called out the names of the disruptive and inattentive children and she did not ignore children's misbehaviour. In another kindergarten classroom, a teacher used isolation techniques, such as standing children in the corner of the classroom. It is also notable that Korean kindergarten teachers frequently used nursery rhymes and hand gestures to attract children's attention. At the beginning of whole class instruction, or at the time of redirecting children's

attention, Korean teachers used nursery rhymes for attention management. In three of the kindergartens where I observed, Korean kindergarten teachers played the piano (other kindergartens used a 'musical tape' and tambourine) in order to maintain children's attention. With various activities, teaching materials, and classroom management techniques Korean teachers held the children's attention. Thus, even in a class of over 30 children, they could keep children attentive.

Child directed activities

All six Korean kindergartens where I observed have free play periods at least once or twice a day. During the free play period, the Korean preschool classrooms are set up in a similar way to a typical English preschool setting. Classrooms were divided into several separate areas that enabled children to choose a range of activities. However, there are several constraints influencing the quality of free playtime in the Korean kindergartens. These are: large class sizes, low adult to child ratio, lack of space and lack of adult support. It is notable that in five out of six kindergartens staff limited the number of children in each interest area. In one kindergarten, there were a pre-set, teacher-determined, maximum number of children in each area (for example, four children for the block area, three children for the computer). When the children chose a favourite area in which to play, they put their velcro name tag on a board at the entrance of each area. After finishing the activity, the children took off their nametags in order that another child could enter the area. They could only proceed to another area where there was space. One teacher said that the kindergarten limited the number of children in each area because of the large number of children and the lack of space. One kindergarten teacher said that it was difficult in practice for one adult to provide supervision and guidance of over 30 children during free play. When she was engaged at an art table with a small group of children, there was little opportunity for other children to interact with the adult.

Outdoor activity

It was noticeable that in all six kindergartens I observed outdoor play was not emphasised very much. All kindergarten teachers whom I interviewed said they appreciated the value of outdoor activity, which has the potential to foster all aspects of development for young children. However, there were a number of practical difficulties that hampered the provision of outdoor activities. For instance, in half of the kindergartens I visited, access to the outdoor play area was not easy because the classrooms were not extended to the outdoor area. When the children arrived in the kindergarten, they removed their shoes and changed into indoor shoes. To move to the outside playground, they needed to change shoes again. Thus, the process of moving to the outside area was complicated. Due to constraints such as these, outdoor play was not provided very often.

Teaching Approach

Lesson Planning

The questionnaire asked about the factors which influenced the early childhood educators' planning such as the National Kindergarten Curriculum, local authority guidelines, school policy and parents' demands (presented in Table 6). Responses to the questionnaire indicate that only 24 per cent of the sample considered that the National Kindergarten Curriculum influenced their planning very much. None of the Korean teachers considered that local authority guidelines influenced them very much, whereas 59 per cent responded that local authority guidelines somewhat influence them. In Korea, there is no significant difference between the National Curriculum and the local authority guidelines.

Table 6. Factors influencing planning in Korean preschools (%) (n = 84)

	very much	somewhat	slightly	not at all
National Kindergarten Curriculum	23.8	52.4	23.8	-
Local Authority Guidelines	-	59.5	33.3	7.2
School policy	28.6	56.0	15.5	-
Parent demands	27.4	56.0	16.7	-

The interviews with Korean kindergarten teachers showed that the National Kindergarten Curriculum is also used just as a guide because it is not adequate for the conditions in kindergarten classrooms. In their view, the National Kindergarten Curriculum is too ideal, and does not take account of the current situation of large class size and low adult child ratios in Korean kindergartens.

In relation to school policy, 29 per cent of Korean teachers responded that school policy did very much influence their lesson planning, whereas most of the Korean teachers claimed that parents had a significant influence on their teaching. Further examination of the data shows that more private kindergarten teachers (very much - 31%, somewhat - 55%) than public kindergarten teachers (very much - 0%, somewhat - 45%) claimed that parental demands influenced their planning. The obvious conclusion to be drawn is that private kindergartens are dependent on tuition fees paid by parents, and so the kindergarten staff need to meet the demands of parents.

Egalitarian approach

As discussed earlier, whole class teaching is a distinguishing feature of Korean preschool classrooms. The emphasis on group orientation in traditional Korean education is clearly reflected in early years education. Korean children are frequently expected to do the same task at the same time. During my observations in six preschools, I saw no examples of ability grouping. Even though the children were split into small groups, they were all given the same task. For instance, children were observed all engaged in completing worksheets, participating in adult directed art projects, singing songs and reading poems.

One teacher said that although differentiating work according to children's perceived ability has many advantages, it is difficult in practice for one adult to provide different educational inputs according to children's needs and abilities. Another teacher mentioned that parents did not like ability grouping, because they were worried their children, (especially those children seen as less able), would acquire a negative self-image. Even though the National Kindergarten Curriculum emphasises providing educational content according to children's different abilities and ages, teachers in Korean kindergartens appear to emphasise an egalitarian approach, disregarding children's individual differences.

Dual emphasis on integrated and subject teaching

The National Kindergarten Curriculum emphasises integrated teaching, not separate subject teaching (MOE, 2001). As we have seen earlier, the majority of Korean kindergarten teachers claim to support integrated teaching. All of the Korean preschool classrooms I observed had a plan of cross-curricular teaching in relation to their chosen themes. However, in four of the six of kindergartens I visited, there were many subjects taught which were not directly related to the topic. Music, physical education, Korean language, science experiments and English conversation were taught as separate subjects. In two kindergartens I observed, there were part-time specialist teachers for physical education, science, and

English conversation. This trend might be interpreted as a result of the fact that most of private kindergartens are highly dependent on parents' support in the form of fees.

CONCLUSION

This study shows that, as Bronfenbrenner (1979) argues, there are interrelations between macro and micro systems of early childhood education in Korea. Early childhood education is embedded in social and cultural contexts. This empirical study shows that there were discrepancies between Korean teachers' beliefs and their practices that are mainly from Western influence. Despite a child centred Korean National Curriculum and the teachers' beliefs, the actual practices in the preschools are significantly different from child-centred philosophies. Even though a child centred National Kindergarten Curriculum emphasises individuality and creativity, in reality, lessons are mainly teacher directed rather than children being encouraged to explore their own personal interests. This study shows that in Korean kindergartens, teachers used approaches including extrinsic motivation, work sheets and separation of play time from work time, which are considered inappropriate in Western early years education. This discrepancy between beliefs and practices could be explained by several factors such as the reflection of Korean traditional education values, the low adult to child ratio, and parental pressure.

The implication of this study seems to be that the application of particular elements of a certain country's educational system, ignoring specific circumstances facing the different countries, is not that likely to bring about expected effects. This study implies that even when educators in different countries adopt ostensibly similar perspectives or practices, their provision would differ depending on their own social characteristics and physical constraints. This study suggests that any educational system is inseparable from its society and preschool education is situated within a specific cultural context. Thus when we adopt some lessons from other countries' theories and practices, we should be conscious of considering their appropriateness for the particular context of a particular country.

Secondly, this study shows that setting an education policy does not guarantee its realisation in the field. This study suggests that the government needs to set up the appropriate apparatus to implement its education policies. For instance, the Korean National Kindergarten Curriculum appears to have had no significant influence on planning in preschool classrooms. This is mainly because, in addition to the inappropriate match between the Korean education policies and the educational contexts in Korean society, the Korean government does not have the proper implementation tools to realise the National Kindergarten Curriculum.

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Attitudes towards Sketching and Drawing and the relationship with Spatial Visualisation Ability in Engineering Students

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The purpose of this study was to examine the attitude of engineering students towards sketching and drawing (S&D) and its relationship with spatial visualisation ability. Three aspects of attitude towards S&D were investigated namely, (a) the view of the professional role of S&D, (b) the personal value of S&D and (c) the usage tendency of S&D. Comparison was made between engineering and architecture students with respect to their attitude towards S&D. The engineering and architecture sample sizes were 57 and 19 respectively. Correlational research design was used to study the association between attitude and spatial visualisation ability. It was found that the mean scores of the engineering students' were statistically less significant on all attitude aspects when compared to that of the architecture students' and that there were statistically significant correlations between usage tendency of S&D and spatial visualisation ability. It was therefore concluded that engineering students had poorer attitude towards S&D compared to architecture students and that there was an association between the usage tendency aspect of attitude towards S&D with spatial visualisation ability.

Attitude, Correlation, Sketching and Drawing, Visualisation, Engineering.

INTRODUCTION

Spatial visualisation ability is "…the ability to mentally manipulate, rotate, twist, or invert pictorially presented stimulus object*s*." (McGee, 1979, p. 893). Studies have shown that this ability influences academic achievements in engineering related subjects such as structural design (Alias, *et al*, 2001), integral calculus (Turner, 1982), mathematics (Tillotson, 1985), computer aided design (Sorby, 1999), engineering problem solving (His, *et al*, 1997) and chemistry (Pribyl and Bodner, 1987). Due to its relevance, ensuring high spatial visualisation ability among engineering students is therefore desirable.

Sketching and drawing (S&D) is one of the most commonly prescribed activities for developing spatial visualisation ability in engineering students, as inferred from course outlines for engineering graphics. S&D is a phrase used to describe all activities of making rough pictures (sketches) of something using pen or pencil and standardised drawings such as engineering drawing. In sketching, the proportions and lengths are simply judged by eye while in standardised drawing the proportions and lengths follow a specific scale. Association between S&D activities and spatial visualisation ability is supported by findings

from spatial ability studies. In two such studies, Fennema and Tate (1985) and Pribyl and Bodner (1987) show that problem solving employing S&D strategy is favoured by high spatial ability students.

Studies have also shown that, in general, positive attitudes towards prescribed learning activities and materials facilitate the achievement of the desired learning outcomes (Simpson, 1978; Young, 1998). Since S&D, as with learning activities and materials, is frequently employed by teachers in trying to develop spatial skills, a possible link between students' attitudes towards S&D and spatial visualisation ability needs to be considered and investigated. Knowledge of the relationship could potentially provide a better understanding of spatial skills development in learners, which could help in the development of better teaching and learning materials and strategies (Yokomoto, *et al*, 1995).

ATTITUDE THEORY

Attitude is a social construct, which is not observable but can only be inferred from other human responses. However, there is no general agreement on a single definition of attitude. Nevertheless, there is a general agreement that attitude is a mental state that pre-disposes a person to act in a certain way towards the attitude object (Oppenheim, 1992; Sudman, and Bradburn, 1982; Oskamp, 1991).

Oppenheim goes further by conceptualising attitude as an entity comprising three attitude aspects, namely, the cognitive aspect, the affective aspect and the behavioural aspect (Oppenheim, 1992). According to Oppenheim, attitudes are reinforced by beliefs (cognitive component), often attracting strong feelings (affective component), that lead to a particular form of behaviour (the action tendency component). This viewpoint is known as the tri-componential viewpoint and is illustrated in Figure 1 where the three aspects are shown to constitute the concept of attitude.
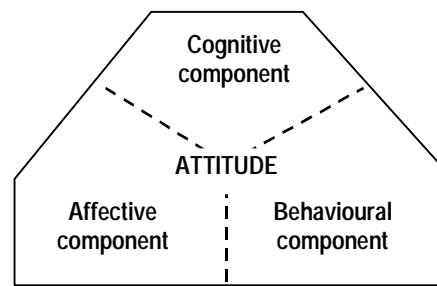
Figure 1. Components of attitude (Oppenheim in Oskamp, 1991)

The cognitive component consists of ideas and beliefs of the attitude holder about the attitude object. For example: 'Sketching and drawing is for draftsmen*'.*

The affective component consists of feelings and emotions of an attitude holder towards the attitude object. For example: 'I like drawing'.

The behavioural component consists of an attitude holder's action tendencies towards the attitude object. For example: 'I tend to use sketching and drawing to communicate'.

The three aspects may interact in the following way: an engineering student who believes that S&D is for draughtsmen will most probably have a low preference for S&D and will not voluntarily choose to use S&D.

THE RESEARCH PROBLEM

Civil engineering students in Malaysian polytechnics were found to have inadequate spatial visualisation ability as indicated by their average percentage score of 50 per cent on a spatial visualisation ability measure, the Spatial Visualisation Ability Test Instrument (SVATI) m(Alias, 2000). Although the development of spatial visualisation skills has been pre-dominantly through drawing, students' predisposition towards the use S&D has never been ascertained.

Studies have shown that students expressing a more positive attitude towards a subject area would endeavour to behave consistently with their attitudes, by investing more time and effort in that area or by seeking additional learning opportunities (Lindquist, 1980). Therefore, it is expected that students expressing a more positive attitude toward S&D would endeavour to behave consistently with their attitudes, by investing more time and effort in S&D activities or by seeking additional learning opportunities. These attitudes therefore, would be expected to predict subsequent performance on tasks related to S&D such as a task involving spatial visualisation ability.

The aims of this study are therefore (a) to evaluate the attitude strength of engineering students towards S&D by comparing theirs to that of architecture students and (b) to see if an association between attitudes towards S&D and spatial visualisation ability is supported by empirical evidence.

Due to the inherent difficulties of measuring attitude, it was not the intention in this study to gain an absolute measure of students' attitude but rather only to gain a relative measure of this attitude. In order to assess this, the relative strength of the engineering students' attitudes was compared to that of architecture students' attitudes. It was expected that the engineering students would have a less positive attitude towards S&D. This hypothesis was based on the analysis of the respective engineering and architecture curriculum. It was observed that for problem solving, the emphasis of the engineering curriculum is on mathematical-analytical skills while that of the architecture curriculum is on S&D skill.

This study is part of a larger study that investigated the relationships of attitudes, teaching and learning, spatial visualisation ability and problem solving (Alias, 2000).

METHODOLOGY

Research questions and hypotheses

The two main research questions are as follows:

1. Are engineering students less positive in their attitude towards S&D as compared to architecture students?

2. Is there any association between attitude towards S&D and spatial visualisation ability?

The main null hypotheses (H_o) and their corresponding alternative hypotheses (H_a) can be stated.

H_{o1}: There will not be a statistically significant difference between the mean scores on the Attitude Questionnaire of the engineering students' and that of the architecture students.

H_{a1}: There will be a statistically significant difference between the means scores on the Attitude Questionnaire of the engineering students' and that of the architecture students.

H_{o2}: There will not be a statistically significant correlation between the engineering students' attitude towards S&D as measured by the Attitude Questionnaire and their spatial visualisation ability as measured by the Spatial Visualisation Ability Test Instrument.

H_{a2}: There will be a statistically significant correlation between the engineering students' attitude towards S&D as measured by the Attitude Questionnaire and their spatial visualisation ability as measured by the Spatial Visualisation Ability Test Instrument.

For the first H_o, the attribute variable is civil engineering or architecture students and the active variable is the scores on the Attitude Questionnaire. For the second H_o, the attribute variable is the scores on the Attitude Questionnaire and the active variable is the score on the SVATI.

Research designs

Two research designs were employed for resolving the two research questions: a two-group *ex-post facto* observation only for the study on the attitude strength and a correlational design for the study on the association between attitude and spatial visualisation ability. The two forms of research design require only one set of observations for each variable. The research designs employed eliminated the following sources of confounding namely, the maturation of subjects, sample instability and regression towards the mean.

In a study such as this, the most likely source of confounding is a non-representative sample. However, a non-representative sample is not expected to be a problem for reasons to be explained in the following section.

Research population and background

The immediate population to which the result of this study can be generalised to is civil engineering students in Malaysian polytechnics. Malaysian polytechnics are post-secondary institutions under the Ministry of Education, established to train secondary school leavers to be technical personnel. Malaysian polytechnics offer two and a half year certificate and three and a half year diploma programs in the various engineering disciplines. A few of the polytechnics do offer other disciplines such as architecture and business studies. Polytechnic programs are open to secondary school leavers who possess the minimum entry qualifications. The highest qualification conferred by polytechnics is the diploma. Upon graduation, students could continue their studies in universities for their degree qualifications.

Intakes into these polytechnics are managed by a central agency, the Department of Technical Education (DTE). Qualified candidates are placed into polytechnics in no particular order resulting in similar distribution of students, with respect to entry qualifications, in all polytechnics. There are currently 15 polytechnics throughout Malaysia. Although each polytechnic has its own director who is appointed by the DTE, the overall management of these polytechnics such as staff appointments, curriculum development, provision for infrastructures and educational facilities are under the DTE. For these reasons, it could be reasonably expected that students following a particular program in one polytechnic are similar to students following identical program in another polytechnic. Therefore, a sample taken from a civil engineering program in any polytechnic could be

reasonably assumed to be representative of the population of polytechnic civil engineering students.

To provide a clearer picture of the context of the study a simplified version of the Malaysian Education system leading to polytechnic education is presented here. Malaysians undergo six years of primary education followed by five years of secondary education. Secondary education consists of three years at the lower secondary (12 to 15 years old) and two years at the upper secondary level (16 to 18 years old). There are two public examinations at the end of each level, namely, the *Penilaian Menengah Rendah* (PMR) at the lower secondary level and the *Sijil Pelajaran Malaysia* (SPM) at the upper secondary level.

The PMR results provide the basis for the streaming of students into the upper secondary level. Students with good grades in mathematics and sciences are enroled into the technical or science stream while those who are not, but who are good in arts subjects, are enroled into the arts stream. Those students who are good in neither group of academic subjects are enroled into the vocational stream at the upper secondary level.

The SPM results provide the basis for entering polytechnics and other higher institutions. The polytechnics' entry requirement for architecture courses differs from the engineering courses. Good grades at the SPM level in technical drawing and art are the requirement for the architecture courses while good grades in mathematics are for the engineering courses.

Research samples

The engineering sample was made up of two intact classes of civil engineering diploma students (19 female and 38 male) from two Malaysian polytechnics, *Ungku Omar Polytechnic* (UOP) and Port Dickson Polytechnic (PDP). The sample is expected to be representative of the population for reasons explained previously.

The architecture sample consisted of 19 architecture students (6 female and 12 male) from both polytechnics who were in the final semester of the Architecture certificate program. The architecture sample was smaller reflecting their population in the Malaysian polytechnics, which is relatively small, compared to the engineering students population. For the purpose of the study, the architecture students from the two polytechnics were grouped into the high, the average and the low achievers. From the three groups, six high, seven average and six low achievers are randomly selected. Overall, 10 students were selected from UOP and six students from PDP.

There were approximately equal proportions of males to females in both groups, that is 67:33 in the engineering group and 68:32 in the architecture group. Therefore, non-equivalent gender proportions were not expected to be a source of confounding. The mean age of the architecture and engineering group was 21 years and 22.5 years respectively. The relatively small age difference was not, on its own, thought to have a large effect on the attitude difference, as both groups were matured students (above 20 years old).

Research instruments

Two research instruments were used in this study, the Attitude Questionnaire and the Spatial Visualisation Ability Instrument (SVATI). The Attitude Questionnaire is a 32-item instrument specifically designed for the study. The length of the instrument was mainly determined by cost and time constraints. Each item in the questionnaire was scored on a five point Likert scale. The Likert Technique was chosen as a measurement method because it is relatively easy to construct besides having a significantly high degree of validity and reliability (Thomas, 1978). With this measurement method, a set of attitude statements was

presented to which the subjects expressed their agreement or disagreement on a five-point scale. Each agreement or disagreement was given a numerical value from one to five. Therefore, a total numerical value could be calculated from the responses given. The attitude statements were in *Bahasa Melayu*.

The content of the Attitude Questionnaire was based on the tri-componential viewpoint. The three attitude aspects studied were (a) the view of the professional role of S&D, (b) the value of personal usage of S&D and (c) the tendency to use S&D, which corresponded to the cognitive, the affective and the action tendency aspects of attitude. The attitude statements were evaluated by three colleagues who were architecture and civil engineering lecturers from UOP. The three lecturers agreed that the statements were indicative of a person's attitude towards S&D. Item analysis performed on the instrument showed that 29 out of 32 items had high item total correlations (ITC), namely, above 0.3, with only three items of lower ITC. Items with the low ITC were identified as double-barrelled items. The overall high ITC indicated that the instrument was uni-dimensional in nature. Table 1 gives examples of attitude statements (translations) corresponding to the three attitude aspects.

Table 1.   Attitude aspects, Questionnaire components and examples of the corresponding attitude statements

Attitude aspects	Components of the Attitude Questionnaire	Attitude statements
Cognitive	View of the professional role of S&D	Sketching and drawing is for draftsman
Affective	Value of personal usage of S&D	I like drawing
Action tendency	Tendency to use S&D	I tend to use sketching and drawing to communicate

The Attitude Questionnaire was designed as two equivalent halves and therefore the Split-half reliability coefficient (r), was the measure used for estimating its reliability. Table 2 gives the reliability coefficients for each sub-scale based on data from the actual study. Two reliability coefficients are below 0.8, possibly caused by a combination of a low number of items and low item total correlations for some items. Some authors have recommended that an attitude measure should have an estimated reliability of at least +0.8 (Thomas, 1978) in order to be a reliable measure of attitude. However, a lower reliability of +0.70 has been argued to be acceptable (Davis in Dyer, 1979). The Attitude instrument and its sub-scales could therefore be said to be reliable.

Table 2.   Split-half reliability coefficients (r_{xx}) for the Instruments

	No. of items	Split-half r_{xx}
Overall	32	0.81
View of professional role of S&D	12	0.8
Value of personal usage of S&D	12	0.7
Tendency to use S&D	8	0.7

The second research instrument, the SVATI was also specifically designed for this study and consisted of a paper and pencil test containing 28 items. Items consisting of three types of spatial tasks were used in the SVATI. Examples of the three types of items are shown in Figures, 2, 3 and 4. The construct validity of these tasks as measures of spatial visualisation ability has been established previously by Embretson (1997); Bartmans and Sorby (1996); Shepard and Cooper (1982) and McGee (1979). The SVATI scores were also highly correlated ($r_{xx} = 0.74$) with the Vandenberg Mental Rotation Test (Alias, 2000), a frequently

used measure of spatial visualisation ability (Vandenberg and Kuse, 1971), lending further support for the validity of the SVATI.

The SVATI had been tried on a comparable group, namely, a group of 20 first year civil engineering students from the University of Surrey, United Kingdom, to ensure that the instrument was reliable. Items were analysed both quantitatively (statistically) and qualitatively and improvements were subsequently made to attain a Kuder Richardson 20 (KR20) reliability estimate of 0.70. Although not excellent, the reliability obtained was deemed sufficient for research purposes, in line with the recommendation by Fraenkel and Wallen (1990).
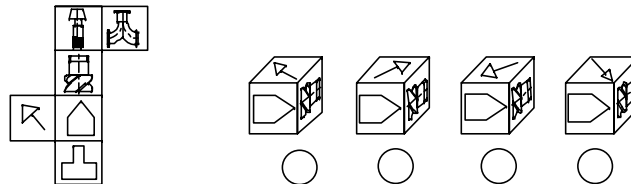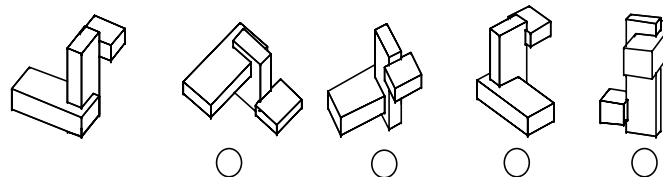
Figure 2. An example of a cube construction item
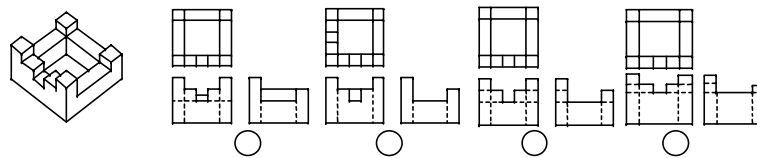
Figure 3. An example of an engineering drawing item

Figure 4. An example of a mental rotation item

DATA ANALYSIS AND RESULTS

Attitude towards S&D

In order to determine whether the engineering students' attitude towards S&D was different from that of the architecture students, the mean scores on the attitude measure were compared to that of the architecture group. The scores on the three attitude aspects of the engineering students were also compared to that of the architecture students to provide a better understanding of the engineering students' attitude towards S&D.

For these purposes two new null hypotheses were formulated.

H_{01}: There will not be a statistically significant difference between engineering students and architecture students in their view of the professional role of S&D.

H_{02}: There will not be a statistically significant difference between engineering students and architecture students in their personal value of S&D.

H_{03}: There will be no a statistically significant difference between engineering students and architecture students in their tendency to use S&D.

The pooled *t*-test was used to test for statistical significance. The assumptions underlying this test were: normality of traits for the underlying population, homogeneity of variance, independence of measure and variances that were additive. Normality was reasonably

assumed and homogeneity of variance was assured as indicated by the results from the *F*-test. The rest of the assumptions were met through the design of the study. Table 3 displays the descriptive statistics and the results of the hypotheses testing.

Table 3. Results of data analysis on the Attitude Questionnaire

$df = 74$, $\alpha = 0.05$ using Excel worksheet after Black (1999)

Data		H_{01}		H_{02}		H_{03}	
		Eng.	Arch.	Eng.	Arch.	Eng.	Arch.
$\bar{x}$	=	39.44	46.74	25.44	31.32	36.77	41.21
s	=	5.82	4.33	3.35	3.62	4.11	5.29
n	=	57	19	57	19	57	19
Power	=	0.998		0.96		0.998	
$t_{(2\text{-}tail)}$	=	4.02		3.79		6.49	
$t_{critical}$	=	1.99		1.99		1.99	

Clearly, the scores for the civil engineering group were lower on all three measures, each by approximately one standard deviation. The results were identical for all three hypotheses tested, namely, the differences in means are statistically significantly different at the 5 per cent significant level with high statistical power (power ≥ 0.96).

It could therefore be concluded that compared to the architecture group, the civil engineering group was:

- less positive in their views of the professional role of S&D

- less likely to value S&D

- less likely to use S&D

Association between attitude and spatial visualisation ability

In order to determine whether there was any association between engineering students' attitude towards S&D and spatial visualisation ability, Pearson correlation coefficients between the scores on the Attitude Questionnaire and the SVATI were calculated. Correlations between the three attitude aspects were also calculated. The results are displayed in Table 4, which generally shows that all attitude aspects were positively correlated to spatial visualisation ability. However, at the 5 per cent level of significance, only the tendency to use S&D is statistically significantly correlated to spatial visualisation ability ($p < 0.5$).

Table 4. Pearson correlation coefficients between the scores on the Attitude sub-scales and the SVATI

$n=57$, $df = 55$, $r_{critical} = 0.26$	Spatial visualisation ability
Views of the professional role of S&D	0.07
Personal value of S&D	0.18
Tendency to use S&D	0.36 *

* $p < 0.5$

To have an overall understanding of the relationships between attitude towards S&D, view of the professional role of S&D, usage tendency and spatial visualisation ability, the above findings were integrated and presented in Table 5. Thus, students' tendency to use S&D was statistically significantly correlated to students' view of the professional role of S&D.

Furthermore, the students' tendency to use S&D was statistically significantly correlated to spatial visualisation ability.

Table 5. Correlations of the Questionnaire components and SV ability ($n = 57$)

|	Value of personal usage S&D	Tendency to use S&D	Spatial visualisation ability
View of the professional role S&D	**0.07**	**0.44 ***	**0.07**
Value of personal usage of S&D		**0.14**	**0.18**
Usage tendency of S&D			**0.36***

* p<.05

DISCUSSION

Of interest to the study was how the engineering students compared in their attitude towards S&D with a group that appreciated S&D. Consistent with the initial assumption it was found that the civil engineering students were less positive in their attitude towards S&D compared to the architecture students. Higher emphasis on S&D in the Architecture curriculum together with unsupportive educational practices are two factors that might explain the difference in attitude. One such practice is the streaming of students into science, arts and vocational stream after their PMR. It is possible that the decreasing academic requirements together with the increasing importance of S&D from science to vocational stream have strengthened the negative association between poor academic performances and S&D.

Another practice is the requirement for good grades in technical drawing and art for pursuing architecture courses in contrast to good grades in mathematics for pursuing engineering courses. This practice might have encouraged the belief that S&D are important to architects while mathematics are important to engineers. Negative perception of S&D is shown by the low score of the engineering students' view of the professional role of S&D. Viewing S&D as being less important might have a negative effect on usage tendency of S&D although the low usage tendency could have been simply due to lack of skills. Further studies are necessary to determine the real cause of the problem.

The high correlation between students' tendency to use S&D and their views of the professional role of S&D was expected, bearing in mind that the subjects are adult learners. According to Knowles (1989), a better career prospect was one the factors that motivated adult learners in their educational undertakings. A positive correlation was also found between the tendency to use S&D and spatial visualisation ability. It was possible that having a high spatial visualisation ability encourages frequent use of S&D which is supported by Fennema and Tarte (1985) and Pribyl and Bodner (1987) who found that subjects with high spatial ability tended to make use of drawing strategy more often in their problem solving. On the other hand, it was also possible that frequent use of S&D causes higher spatial visualisation ability, which was indirectly supported by the finding from a study by Alias, (2002) on spatial visualisation ability.

A model is suggested in Figure 5 for the relationships between attitude, view, usage tendency regarding S&D and spatial visualisation ability based on empirical evidence. In this figure, the engineering students' view of the professional role of S&D is shown to be related to their tendency to use S&D. This figure also shows that students' tendency to use S&D is related to spatial visualisation ability.
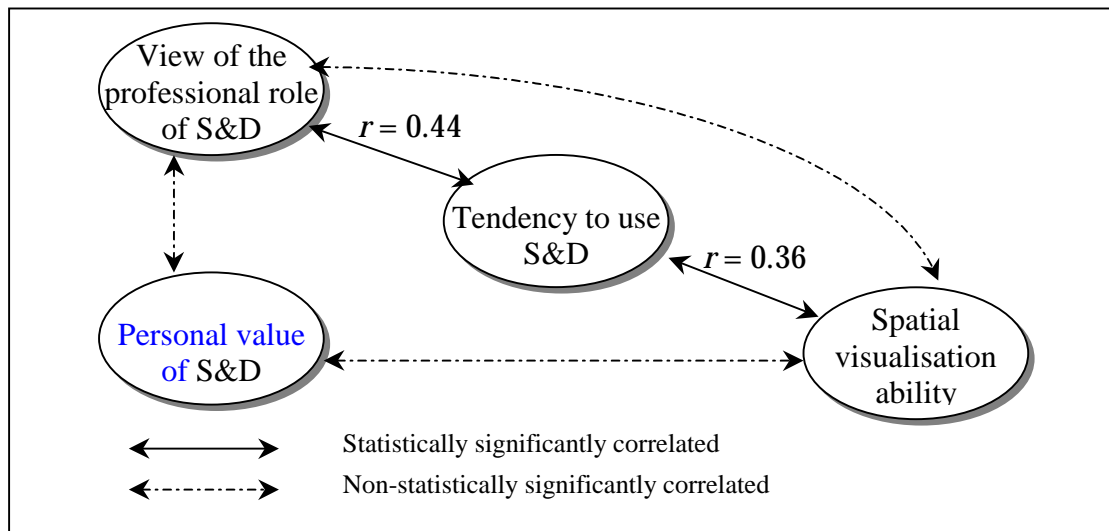
Figure 5.   Suggested model for the relationships between the attitudes towards S&D, and spatial visualisation ability for engineering students based on empirical evidence

CONCLUSION

Evidence was found linking spatial visualisation ability directly to usage tendency aspect of S&D and indirectly to students' view of the professional role of S&D. This finding could be interpreted as views of the professional role of S&D having a motivating effect on usage tendency of S&D, which may lead to higher spatial visualisation ability. If this interpretation was accepted, the poor view that students hold of the professional role of S&D as well as their low usage tendency of S&D would be inadequacies that needed to be dealt with especially if S&D were employed in the development of spatial visualisation ability. In other words, any attempt to improve spatial visualisation skills in engineering students through S&D has to consider the influence of students' views of S&D. Adequate emphasis should be placed on developing awareness, understanding and acceptance of the important roles of S&D to their future profession. This acceptance is likely to increase usage of S&D and ultimately spatial visualisation ability. For teaching and learning in general, creating students' awareness on the relevance of the learning materials to their future undertakings would surely be one way of motivating students in their studies.

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Mathematics and Culture Nexus: The Interactions of Culture and Mathematics in an Aboriginal Classroom

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Approaching the teaching and learning of mathematics from a cultural standpoint serves a two-pronged purpose: It tends to build a bridge between the student's background knowledge, and the formal mathematics teaching and learning the student would encounter over several years in a typical school setting. This bridge, if appropriately built and solidified, facilitates the learning of mathematics especially in aboriginal communities, where tradition and culture play significant roles in the lives of youngsters. This paper is an effort in that general direction - the building of a bridge between culture and mathematics. It focuses on mathematics instruction in aboriginal classrooms, utilising environmental phenomena, materials and practices in traditional Cree settings as inviting 'appetisers' to introduce and vivify mathematics teaching/learning.

Set in an aboriginal (Cree) community in Northern Manitoba, Canada, the paper highlights the positive effect, and overwhelming influence, that integrating the learner's culture and environment into mathematics instruction had on a group of undergraduate pre-service, aboriginal teachers.

Interactions, Culture, Mathematics, Aboriginal, Classroom

INTRODUCTION

Enrolment in mathematics and science courses at all levels of education is an issue that has attracted the attention of educators and researchers over a long period of time. In recent years, the issue has gained more prominence because of rapid declining enrolment patterns in these subject areas; a situation that has assumed alarming proportions worldwide (Ezeife, 1999a). As reported by the National Research Council on the future of mathematics education (1989):

> Mathematics is the worst curricular villain in driving students to failure in school. When mathematics acts as a filter, it not only filters students out of careers, but frequently out of school itself.

Still dwelling on the unpopularity of mathematics as a school subject, the National Research Council (1989) stated:

> Public attitudes about mathematics are shaped primarily by adults' childhood school experiences. Consequently, mathematics is seen not as something that people actually use, but as a best forgotten (and often painful) requirement of school. For most members of the public, their lasting memories of school mathematics are unpleasant – since so often the last mathematics course they took convinced them to take no more.

Backhouse, Haggarty, Pirie, and Stratton (1992) paint a similar picture, observing that for some learners, "the word they can best associate with mathematics lessons is 'panic'!" Even

such highly industrialised countries as Canada and the United States of America are not free from the declining enrolment plague. Recent studies (Ezeife 1999b; Smith 1994) indicate that the situation reported by the National Research Council in the late 1980s is getting worse worldwide, especially with regard to the enrolment and performance of minority groups in mathematics/science courses. Narrowing the analysis further, it is known that North American Aboriginals are under-represented in mathematics, science, and related disciplines. Schilk, Arewa, Thomson, and White (1995) aptly describe the situation, stating:

> Native Americans have the lowest representation percentage of all minorities in scientific careers and are at risk in pursuing science in high school and in post-secondary education.

Davison (1992) specifically draws attention to the situation in mathematics, saying, "What cannot be questioned is that the mathematics achievement of (*American)* Indian students as a group is below that of white students in the United States". The plight of Canadian Aboriginals is similar to that of Native Americans with regard to low enrolment, substandard achievement, and high dropout rates in science, mathematics, and technological fields, as observed by MacIvor (1995).

Why is the situation as it is? Can anything be done to rectify and improve the status quo with regard to the teaching and learning of mathematics in aboriginal communities? If so, what can be done? How can we set about doing it? These are the key questions this paper will address.

Why is the situation as it is?

One of the reasons advanced for the high dropout rate and poor performance in examinations by the few aboriginal students who enrol in mathematics or science is that mathematics and science taught in school is bereft of aboriginal cultural and environmental content (Cajete 1994; Smith 1994). Accusing fingers have also been pointed at the way mathematics is taught in schools, and the lack of relevance of mathematics content to the students' real life experiences. Expatiating on the issue with respect to Native Americans, Davison (1992) stated:

> American Indian students' capacity to learn mathematics is influenced by language, culture, and learning style. However, the methods by which mathematics is typically presented do not take into consideration these factors. Textbooks … present mathematics as an essentially abstract subject. While many textbook series now refer to the use of tactile and visual aids, few teachers present mathematics in other than an abstract manner. To learn mathematics successfully, many American Indian students need a more multisensory approach to mathematics than is usually encountered in schools.

Need to improve aboriginal students' enrolment in mathematics

The need to increase aboriginal students' enrolment and participation in mathematics can be seen from several viewpoints. First and foremost is the importance of mathematics and related disciplines in the development of aboriginal communities. At present, there is an urgent need for local personnel to take over the servicing of community infrastructure in most aboriginal communities in North America. However, there is an acute shortage of qualified local personnel, and so these communities have to depend largely on outside experts who are hard to get, difficult to retain, and definitely exorbitant to maintain. An aboriginal research and author, Cajete (1994) lamented on this situation, stating:

> Alienation from science, as it is conventionally taught, is widespread among Indian students (*by 'Indian' here, the author means native American, that is, aboriginal*). This affects student performance in mathematics and science as indicated by their generally low test scores in science and related areas. This alienation from science has resulted in lack of science expertise among all

tribes, leaving them vulnerable to exploitation and dependency on non-Indian consultants for decisions related to resource development, health, and other areas requiring scientific expertise.

No doubt, qualified local personnel would serve their communities better in terms of ready availability, and dedication to positions they might hold in the communities. The availability of such qualified personnel in the communities would also instill a spirit of self-reliance and self-sufficiency in the community, and with time, might lead to the production of more qualified manpower as younger community members could gradually learn from the older ones through the apprenticeship system - the age-old method of knowledge transfer in indigenous societies.

Employment opportunities in aboriginal communities in North America can be boosted if aboriginal students enroll more in mathematics and related disciplines because these areas of study can lead to careers in computer and technology fields - specialties that aboriginal reserves are in dire need of at present. Expertise in technological fields would not only help in creating new jobs in aboriginal communities but would also go a long way toward modernizing the traditional, aboriginal occupations of fishing, hunting, trapping, and arts/design - enterprises that have sustained these communities over centuries, but which now desperately need the injection of newer techniques, tools, and equipment to remain viable.

The need for aboriginal students to participate in mathematics can also be addressed from a historical standpoint. It is known that indigenous people of old were enthusiastic students of nature, astronomy, and mathematics. Several authors (Cajete 1994; Smith, 1994; Hatfield, Edwards and Bitter 1997) have documented the wealth of knowledge and experience of these indigenous peoples around the world. Unfortunately, however, a lot of this knowledge suffered blows of expropriation during eras of colonization in areas of the world currently referred to as third world countries, and also in aboriginal societies. D'Ambrosio (1985) addresses this issue when he notes that there is:

> … a very broad range of human activities which, throughout history has been expropriated by the scholarly establishment, formalized and codified and incorporated into what we call academic mathematics but which remains alive in culturally identified groups and constitutes routines in their practices.

Hatfield, Edwards, and Bitter (1997) documented specific examples where people of diverse cultural backgrounds had displayed mathematical and scientific ingenuity in the past. The same authors went further to cite instances of expropriation of some of these activities and knowledge throughout the history of the development of mathematics. For example, in Arithmetic, they wrote:

> Many peoples contributed to the development of the modern system of numerals. Africans were the first to use numerals. Ancient Egyptians in Africa invented a symbol for ten that replaced 10 tally marks and a symbol for one hundred that replaced 100 tally marks. The Chinese invented negative numbers. Native Americans were the first to use a symbol for zero. Ancient Egyptians invented unit fractions.

On 'Algebraic concepts', the authors wrote as follows:

> Students should know that Africans invented rectangular coordinates by 2650 B.C. and used them to make scale drawings, and starclocks. …The word *algebra* is Arabic in origin. …Europe received algebra as a gift from Asia and Africa.

And on 'Geometric concepts' and 'Applications', the same authors stated:

> …the first concepts of congruence were developed in Africa and Asia. …cotangents and similar triangle principles were used in the building of African pyramids.

> …Eskimos built igloos in the shape of a catenary. Mozambicans built rectangular houses by using equal-length ropes as the diagonals. The Babylonians used the right angle theorem 1500 years

before Pythagoras was born. The term ***Pythagorean theorem*** is a misnomer. …The modern method of using the ***so-called*** Pascal's triangle was actually invented in Asia by the Chinese and the Persians 500 years before Pascal was born.

Having observed the fact that in the olden days, people of indigenous cultural backgrounds displayed a high degree of expertise in mathematics and related fields, one would expect that the present generation of students from these backgrounds should also do well in such fields of study. Following that line of reasoning, one would expect contemporary aboriginal students to enroll, and participate enthusiastically in mathematics, not to run away from it. It seems that their current negative attitude toward mathematics arises from a number of factors - the lack of aboriginal content and culture in mathematics curricula used in schools, the way and manner mathematics is presented to the students, the lack of relevance of the mathematics learned to the students everyday life and worldview, the issue of learning styles, etc. Thus, my position is that injecting aboriginal content and culture into the curriculum, and introducing innovative mathematics teaching and learning approaches (as discussed later in this paper) would bolster enrolment of aboriginal students, and improve their performance in mathematics. My position on the issue is further strengthened when cognizance is taken of the fact that such approaches have been effective in boosting enrolment, retaining students, and improving performance in school settings and other learning environments where they have been tried out recently (Hanson, 1994; Semken and Morgan, 2000; Simard, 1994).

Issue of culture

The students' culture has been identified as one of the factors that strongly influence mathematics learning, particularly in respect of indigenous learners. What is culture? Hollins (1996) states that:

> Culture is … the essence of who we are and how we exist in the world. It is derived from understandings acquired by people through experience and observation (at times speculation) about how to live together as a community, how to interact with the physical environment, and knowledge or beliefs about their relationships or positions within the universe.

Barrett (1984) as quoted in Hollins (1996) defines culture as "the body of learned beliefs, traditions, and guides for behavior that are shared among members of any human society". Similarly, Erickson (1986) states: "Culture, as a social scientific term, refers to learned and shared standards for ways of thinking, feeling, and acting". However, it was Hall (1977) as quoted in Hollins (1996) who concisely described the function of culture, thus:

> Culture is man's medium; there is not one aspect of human life that is not touched and altered by culture. This means personality, how people express themselves (including shows of emotion), the way they think, how they move, how problems are solved, how their cities are planned and laid out, how transportation systems function and are organized, as well as how economic and government systems are put together and function. …"

Looking closely at the above discourse, we can decipher that culture would have a pervading influence on how a group of people live and learn. The culture of aboriginal populations, for instance, would affect how they learn and retain what they are taught in school. It is culture that shapes their learning styles in mathematics, for example, determining to a large extent, to what use they put the mathematics knowledge they acquire in school.

LEARNING STYLES OF ABORIGINAL STUDENTS

Alonge (1982) compared the teaching and learning styles in indigenous cultures with the Western model. For indigenous societies, he said that the methodology consists essentially of:

> Oral tradition (listening, watching, and doing). Individualised instruction. Group work. Apprenticeship. Teaching materials are real, physical objects…

In contrast, the Western model consists of:

> Group instruction in classrooms; Use of sophisticated gadgets and of instructional materials, e.g. books, film, radio, television.

Several other authors and researchers have also addressed the matter of teaching and learning styles in aboriginal societies. For instance, Cajete (1994) stated:

> …American Indian education historically occurred in a holistic social context that developed the importance of each individual as a contributing member of the social group. Tribal education sustained a wholesome life process. It was an educational process that unfolded through mutual, reciprocal relationships between one's social group and the natural world. This relationship involved all dimensions of one's being, while providing both personal development and technical skills through *participation* in community life. It was essentially a communally integrated expression of environmental education.

Stairs (1995) is another author who contrasted Aboriginal and Western models of education. Referring to the work of Wenzel (1987), Stairs (1995) used the Inuit words '*Isumaqsayuq*' and '*ilisayuq*' for aboriginal education and Western-style education respectively. The author goes on to describe these two models, thus:

> *Isumaqsayuq* is the way of passing along knowledge through the observation and imitation embedded in daily family and community activities, integration into the immediate shared social structure being the principal goal. The focus is on values and identity; developed through the learner's relationship to other persons and the environment.

> In contrast, i*lisayuq* is teaching which involves a high level of abstract verbal mediation in a setting removed from daily life, the skills for a future specialized occupation being the principal goal.

It seems appropriate to conclude from the foregoing that there are obvious differences between the teaching, learning and cognitive styles of people from aboriginal cultures and those from mainstream Western cultures. These differences would surface and influence learning, positively or negatively, wherever students from these two cultures are subjected to the same instructional approaches, and are expected to learn – using the same cognitive styles. If the instructional method favours the learning styles of students from Western cultures (as seems to be the case in contemporary formal school settings), then these students would perform quite well, while the performance of the disadvantaged students from indigenous cultures would not be as good. However, if indigenous students are given the opportunity to learn through an instructional medium that favours their learning or cognitive styles, then the likelihood is that learning would be facilitated and enhanced. It seems reasonable to suggest, therefore, that a good way to teach aboriginal students would be to adopt a strategy that conforms to the age-old methodology of educating the young in indigenous, traditional settings, that is, culturally and environmentally based education. The rest of the paper would suggest and discuss this strategy, focussing on the discipline of interest, that is, mathematics.

Use their culture, teach them better

Davison (1995) strongly discourages teaching mathematics to students from indigenous cultures through instructional methods that emphasise the abstract, as opposed to the concrete, the imaginary rather than the real. He stated: "The abstract, decontextualized teaching of mathematics has affected many American Indian students' school success". To remedy the situation, he suggests:

> Wherever possible, mathematics concepts should be presented in a culturally relevant manner, using situations that the students find interesting and familiar. Above all, the presentation of

mathematical ideas needs to be consistent with how students learn. The use of a tactile or visual approach assists students to form meaningful images.

How will linking math with the students' culture help improve participation?

In discussing issues related to the psychology of learning, Ausubel (1968) stated emphatically:

> If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

Every educator is aware of the fact that young children acquire knowledge early in life from their parents and family members, from their homes, playmates, and peers. This early knowledge acquired by youngsters is inter-twined with the cultural milieu and environment in which the children are born and grow up. Hence, by the time the children get to school, they already have a considerable amount of experience and prior knowledge ingrained in them through their home and peer group interactions. If the school culture reinforces the students' home cultures, prior knowledge and learning experiences, then learning is facilitated for these students; if not, learning is drastically inhibited. The situation described here holds true, to a greater or lesser degree, for all students, but is more cogent for aboriginal students most of whom live in remote and secluded reserves in North America. When these aboriginal students get to school, and encounter a subject like mathematics, they find themselves disadvantaged because the mathematics curriculum currently in use in most schools is alien to them, and so are the teaching and learning styles, and illustrations adopted. Shirley (1995) addressed this issue, stating:

> The problem for many teachers is that most of the mathematics in our academic curriculum has been derived from the developments in European mathematics, and they have difficulty finding examples that do not seem Eurocentric.

Continuing, the same author noted:

> Since our schools have increasingly heterogeneous populations from many different cultures around the world, an apparently European-based curriculum can be counterproductive to our interest in recruiting members of underrepresented groups into mathematics. If children see mathematics only from a European perspective, they may believe that non-European cultures have not worked with mathematics and, even worse, that these people cannot work with mathematics. If the child comes from a non-European cultural heritage, this belief may be dangerously extended to "*I cannot* work with mathematics.

Thus, a culture-sensitive curriculum would go a long way toward rectifying the errors that currently exist, and making mathematics attractive to all students, especially students from the under-represented aboriginal block. The utilisation of a culture-sensitive approach to teaching has resulted in success in some recent cases. For instance, Simard (1994) reported the impressive outcome of an integrative, culture-based approach employed at a Winnipeg high school in the province of Manitoba, Canada, thus:

> Children of the Earth High School is an example of an urban school that teaches the regular Manitoba curriculum from a cultural perspective. One day is set aside each cycle for what is called the cultural program. Between 15 and 20 courses are offered during that day to 250 students. The courses range from outdoor education to traditional dance instruction. This is an example of a school initiated course of study. The aboriginal languages of Cree and Ojibway are compulsory at Children of the Earth School. The school has been very successful in graduating students from the grade 12 program into post-secondary institutions. The use of community people and their wide array of talents helps put back meaning into education.

Several researchers and pioneers in this field (Cajete, 1994; D'Ambrosio, 1980; Davison, 1992) have advocated the use of holistic and multisensory approaches to mathematics and science teaching. For aboriginal students in particular, teaching mathematics by the use of methods and instructional designs that glorify the familiar explain-example-exercise pattern of expository teaching (Matang, 2001), has led to the high dropout rates from mathematics and associated science courses. For such students, "rules without reasons", frequently used in mathematics teaching, as exemplified by "change side, change sign" (Backhouse, Haggarty, Pirie, and Stratton, 1992), have often led to confusion, not comprehension.

THE MATHEMATICS AND CULTURE NEXUS

Having gathered from relevant literature that an effective method of teaching mathematics to indigenous students would entail injecting elements of their schema (prior life experiences that have saliency for them), culture and environment into mathematics teaching, I set out to experiment with a group of aboriginal pre-service teachers in my Mathematics Methods class. This was done in a Cree-speaking aboriginal community in Northern Manitoba, Canada. As a first step, the pre-service teachers were sensitized to the wisdom in, and potential benefits of using this approach (injecting students' schema, culture, and environment) into mathematics teaching. This sensitization was done through a series of lectures and laboratory sessions that examined several programs that have attempted to incorporate into instruction "the four essential elements of learning for underserved populations of students" (Hollins, 1996). These "essential elements" of meaningful learning as identified by Hollins (1996) consist of "culturally appropriate communicative patterns, social interaction patterns, information processing strategies, and culturally valued knowledge and skills". One of the programs discussed with the pre-service teachers was the "Algebra Project" which, as cited in Hollins (1996), was developed by Moses et al (1989). A detailed description of this project is given by Hollins (1996), thus:

> In the Algebra Project, instruction is based on motivation rather than ability as a prerequisite for intellectual development and achievement. …Instruction in the Algebra Project employs the third dimension of meaningful learning for a specific population by building upon the students' learning preferences and strengths derived from their cultural and experiential background to extend their knowledge and skills. That is, the students use the familiar to extend their knowledge and understandings. The instruction begins in the expressive domain with the students gathering informal knowledge in familiar places, developing questions, identifying relationships and moving to the descriptive domain to construct formal knowledge that is procedural and empirical-analytical. This is most evident in the five-step teaching and learning procedure for supporting sixth graders in their transition from arithmetic to algebra. The five-step approach includes the following:
> 1. Physical event,
> 2. Picture model of this event,
> 3. Intuitive (idiomatic) language description of this event,
> 4. A description of this event in regimented English, and
> 5. Symbolic representation of the event.

This is a student-centred approach to mathematics teaching that gradually builds up students' learning from the known (familiar) to the end product (target) of instruction. This is in line with Silberman's (1971) assertion that "A teacher must start where his students are, if he is to take them someplace else". Stairs (1995) described another example of an integrated approach to instruction of indigenous students, as follows:

> In northern Alaska, the Inupiaq *qargi* – the community house where youth traditionally went to listen to and learn from elders – is being reestablished on a trial basis as a parallel to the modern formal school. This is a response to almost fifty years of assimilationist education which has resulted in a generation of children who are virtual strangers to the Native culture. In the new *qargi*, in Native language, a young professionally trained Native teacher would work side by side with the elders of each community, thereby allowing the teacher to absorb both the knowledge

> possessed by the elder(s) and the manner in which the children were taught. …Skills learned in school, such as mathematics, could be applied in *qargi*, where children are building sleds or boats, for example.

Apart from the innovative, culturally oriented programs exemplified by the Algebra Project and the "Inupiaq *qargi*", the pre-service teachers in the study were also introduced to approaches that utilise the multisensory strategy for mathematics instruction. In this context, Gardner's eight multiple intelligences, as discussed by Hatfield, Edwards, and Bitter (1997) was given prominence. The theory states that there are eight basic intelligences (Linguistic, Logical-mathematical, Naturalist, Bodily-Kinesthetic, Spatial, Interpersonal, Musical, and Intrapersonal) that human beings use for the purpose of processing information. As Hatfield, Edwards, and Bitter (1997) stated:

> Gardner believes that people of all ages learn better if the material is presented through areas of intelligence in which they are most gifted.

Citing Armstrong (1994) and Lazear (1991), Hatfield, Edwards, and Bitter (1997) noted that the appeal of the theory lies in the fact that "all teachers know that they can reach some children better through one medium than another".

TERM PROJECT

After the theoretical discussion of the programs and approaches, the pre-service teachers were given a major term project that required them to compile a list of phenomena, materials, activities and traditional practices from their schemata, culture, and immediate environment that could be used to teach mathematics in the elementary and middle Grades. As part of the project, the teachers were asked to state and briefly explain the mathematics topics, concepts, or principles that could be taught using the materials, phenomena, and traditional practices. Finally, each of the teachers was required to prepare and present a mathematics lesson that not only incorporated the cultural background of the learners, but also utilised at least three of the eight Gardner's multiple intelligences. They were also asked to ensure that the instructional materials and planned activities for the lesson would cover the broader classification of mathematics suggested by Shirley (1995). The adapted version of Shirley's (1995) broader classification of mathematics is given in Table 1.

Table 1. Broader classification of mathematics

Mathematics	Pure	Applied
Formal	Academic	Occupational
Informal	Recreational	Everyday

Observed outcome

The interest generated by the project in the Mathematics Methods class was overwhelming. The immense possibilities of what could be achieved in a mathematics teaching and learning situation by adopting and adapting culturally relevant experiences, common everyday materials, events, and artefacts in the locality, seemed to dawn suddenly on the pre-service teachers. The enthusiasm and promptness with which they handed in their projects, the depth of research that went into the preparation of instructional materials, and the vivacity that characterised the presentation sessions were eloquent testimonies that the approach struck a chord. The students felt happy to be operating on familiar, home turf. It seemed that the teachers suddenly discovered that mathematics is, after all, part and parcel of their everyday life, that it is a familiar, close-to-home subject, not a far-off foreign invention. Some of the traditional practices, materials, activities, and phenomena adapted from the students' compilation are listed in Tables 2 (Ezeife, 2000).

Table 2.   Examples of environmental phenomena, materials and practices in traditional Cree settings that could be used in mathematics teaching

Phenomenon, material, activity, or traditional practice	How or where it can be applied in mathematics teaching and learning
Forest fire *(Epasitek nocimihk)*	Heat – Measurement of Temperature, Ratios - Conversion between temperature scales, wind direction, land areas
Bannock lunch *(Pah-ke-sikun)*	Fractions, Decimals, Percents, Concepts of division and Symmetry
Log cabins *(Os-ka-nsa)*	Width, Length, Areas, Geometric figures; Accounting – Costs, Money (Counting/Conversion/Units)
Bow and Arrow *(Achabi ekwa akask)*	Speed and Distance, Direction and wind effects
The 'square' dance *(Neem-o-win)*	Geometrical patterns depicted by various dances; Angles, Slopes
Fish nets *(Anapi)*, Fishing; Canoe *(Chee-man-is)*	Probability, Mass and Weight, Geometrical shapes, Balances, Use of scales
Snowshoes *(Asamak)*; Moccasins *(Pakek-ine-skisina)*	Ratios and Proportions – relationship between shoe size and height; Estimation/measurement of length and width; Areas and Perimeters; Use of (linear) measuring instruments; Metric units; Patterns (beadwork in shoes)
Population on "Reserve" lands *(Inni-no-wak)*	Statistics and Probability; Numeration – Census; Classification and analysis of data;
	Measures of Central Tendency (Mean, Median, Mode) to be calculated using the ages of community members, Graphing – histograms and bar graphs [Age could be used as categorical (non-numerical data) for bar graphs]
Paddles *(Apoyak)*	Construction and Measurement; Mass and Weight; Areas and Volumes; Angles and their measurement – various angles made by paddles on contact with water
Moose-hide mitts *(Astisak)*	Shapes and Patterns (beadwork); Symmetry
Dog team sleds *(Otapahistiman)*	Distance, Speed, and Time – Measurements and calculations involving these
The "red" sunset *(Mi-kwa-yow)*	Probability and Weather Forecasting; Using natural phenomena as indicators/predictors of future events
Berry picking *(Mominewin)*	Mass, Weight, and Volume measurements; Metric units – the kilogram – its multiples and sub-multiples
Cradle board (for carrying babies at mothers' back) *(Tikinakun)*	Shapes and Angles; Mass and Weight; Length and Width (dimensions) and their measurement
Ice holes *(Toyhikun)*	Estimation and measurement of depth. Ice fishing – Probability of fish caught; Volume (of water in hole); Problem solving and reasoning/logic
The campfire game *(Isk-koo-jekan)*	Mathematical Operations – Concept of Subtraction as reduction/'elimination', Number games; Addition as the reverse operation of Subtraction.
Thunderstorm *(Pine-siwun)*	Statistics and Probability; Speeds of Sound and Light – Ratios and Proportions (Comparison of speeds).

∗ Words in parentheses and italics in the first column of Table 2b are Swapy Cree dialect

Trial of model

As part of the research study in the same community, a model mathematics lesson incorporating culturally relevant materials was developed and tried out on a study sample of 20 Fifth Grade students on an informal basis. The lesson was on Geometry and the topic was Angles and their Measurement. The environment, students' everyday activities, events and

infrastructure in the community were utilized to make the lesson true to life, relevant, and hence meaningful to the students. For instance, a log house in the community was used for instruction. As expected, the young students' response was exhilarating, as they enthusiastically participated in the activities used in the lesson, and even suggested innovative activities of their own. Apart from active student participation in class, another pointer to the fact that the approach adopted in the lesson struck a positive chord with the students was the fact that when two follow-up lessons were arranged some weeks later for the same group, all previous participants promptly showed up, even though these follow-up sessions were held on weekends. Even the four "recognized truants" who reportedly previously invoked any imaginable excuse just to stay away from regular school mathematics classes, never missed any of the research lessons (Ezeife, 2000). Furthermore, two of these hitherto truant students actually volunteered to lead their groups during small-group class discussions and field activities in the follow-up lessons. That attests to the efficacy of the approach used, and the interest and willingness to participate, it generated amongst the young, aboriginal learners. These informal sessions and activities seem to suggest a follow-up study that could be carried out later in a formal, experimental setting to compare the integrated cultural model (mathematics and culture nexus approach) with existing methods of mathematics instruction in regular school settings. Detailed curriculum materials would be developed for instruction along the mathematics and culture nexus model for a Middle Years Grade (for example, Grade 7). When developing curriculum materials for instruction in the project, Shirley's (1995) broader classification of mathematics would be used to ensure that the narrow academic orientation given to mathematics in formal school curricula – a situation that, in itself, has driven many students away from mathematics – is broadened, so that students would appreciate mathematics in its entirety. The proposed follow-up study, which would be empirical in nature, would essentially evaluate the hypothesized approach suggested in this paper in relation to the regular method currently adopted in teaching mathematics to aboriginal students. One of the goals of this paper was the laying of the foundation for the proposed, detailed, experimental work.

SUMMARY AND CONCLUSION

This paper has examined the issues of culture and mathematics teaching/learning, enrolment and performance in mathematics, of aboriginal students. The paper has taken the position that both enrolment figures and performance standards can be improved upon if indigenous students are taught mathematics using culturally oriented approaches and practices. With most aboriginal students, mathematics receives superficial attention because there is no linkage between it and their cultural values, little or no relevance to their daily life, and so no connection is established. The resultant poor performance in mathematics is, therefore, a foregone conclusion. As Hollins (1996) correctly stated, "Information receiving superficial attention may enter short-term memory or be immediately discarded".

The paper drew attention to the fact that the aboriginal culture is holistic, not linear, interconnected with nature, not in control of it (Hanson, 1994). Holistic oriented learners tend to learn best by focussing on how things are interrelated. They prefer to see the whole picture before them, and then analyze and make meaning of it. Thus, Aboriginals belong to what Hollins (1996) refers to as high-context culture groups. Dwelling on this, Hollins (1996) states:

> High-context cultures are characterized by a holistic (top-down) approach to information processing in which meaning is "extracted" from the environment and the situation. Low-context cultures use a linear, sequential building block (bottom-up) approach to information processing in which meaning is constructed.

The conclusion to draw from this analysis is that if there is no input from the environment and culture in teaching and learning situations, the students who utilize the top-down (holistic) thought processing mode are disadvantaged. This, to my mind, is one of the obstacles that has affected the performance of indigenous students in mathematics over the years – there is a conflict between how they learn, and how mathematics has been presented to these students. If the teaching approach is changed, the curriculum made culture-sensitive and environmentally oriented, we may look forward to producing aboriginal world-beaters in the discipline of mathematics. Gladly, some recent efforts have been made to develop culturally oriented instruction models for teaching aboriginal students, not just in mathematics, but also in science-related disciplines. The work of Semken and Morgan (2000), which deals with the "parallel use of Din and Euro-American scientific concepts" in a physical geology course at Navajo Community College, United States of America, is a bold step in this direction. No doubt, the call made several years ago by pioneers like D'Ambrosio (1985) and Cajete (1994) for the injection of socio-cultural activities specific to indigenous societies around the world, into the teaching of mathematics and science is progressively being hearkened to, as several research centres have sprung up with a view to developing culture-sensitive curricula for teaching indigenous students. One such viable research establishment is the Walpole Island Heritage Centre on the Walpole Island First Nation in the province of Ontario, Canada. Referring to the significance of the work of the Centre, its executive director, Jacobs (1992) stated:

> The wisdom of our elders must be recognized and respected. To the extent possible, traditional knowledge should be documented and codified. Regional centres of traditional knowledge should be established in native communities and supported by all sectors.

The opening of the Glen Lean Ethnomathematics Centre (GLEC) on June 20th 2001, is another major milestone in the effort to inject indigenous knowledge, culture, and environment into the teaching and learning of mathematics. As Matang (2001) explained, it is "a research centre committed to promoting the advancement of indigenous mathematical knowledge through research and preservation of ethnomathematical knowledge". Such efforts, reinforced as the years progress, would surely bring a positive wind of change with respect to enrolment and performance of indigenous students in mathematics, science, and technological fields. The ultimate goal, of course, would be to develop rich mathematics and science curricula specifically and entirely tailored to the needs of indigenous students.

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School Violence and its Prevention in Israel

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This article opens with a comparative bird's eye view of school violence as a serious world-wide problem, thereafter focusing on school violence in Israel. It draws attention to the fact that school violence in Israel has been recognised as a grave problem for years. It draws attention to the fact that schools are more violence-prone than clubs, cinema-theatres, community centres, even discotheques. What is more, the article cites data that clearly indicate that the situation is going from bad to worse. The article briefly reviews numerous surveys that reflect this situation, and expands on violence as the liability of the school system. It then moves on to analyze a certain violence-prevention program devised by and implemented in a certain junior high school in a medium-size town in greater Tel-Aviv. The article tries to explain why the intervention program should be judged a failure, and points out that this is typical of many other programs initiated in the Israeli school system.

Juvenile delinquency, school violence, bullying, aggression, harassment, anxiety and fear, intervention and prevention programs in schools

INCREASE IN THE NUMBER OF CRIMINAL OFFENCES AND JUVENILE CRIMINAL OFFENCES IN ISRAEL IN RECENT TIMES

School violence is an increasing concern in Israel. Israeli figures show that both criminal offences as well as violence have increased since 1990 at an alarming rate. Israeli police data reveal that while the number of delinquents caught stood at 62,916 in 1990, it reached 119,484 in 2000 – almost a 100 per cent growth (MIS, 2000). At the same time Israeli population growth stood at a mere 34.8 per cent (CBS, 2001).

There again, in the very same period the number of juvenile delinquents caught by the police grew by 38.5 per cent, from 6,910 to 9,570 (MIS, 2000). In other words, the growth in juvenile delinquency lags far behind the general growth in criminal offences, and yet its rate is marginally higher than the population-growth rate.

To sharpen the picture it is only necessary to mention that the increase in the number of criminal files opened for minors aged 12-18 years reached 16.8 per cent between 1997 and 1998. Moreover, the number of criminal files opened for minors in 1998 was ten-fold bigger than in 1988 – 11,060 as against 1,030. The population growth over the same period was a mere 30 per cent (Gumple, 2001, p.9).

Violence merits special attention in any discussion of both adult and adolescent delinquency; all the more so when it is interpreted as a behaviour pattern, causing physical or psychological harm to a third party, entailing degradation or use of force.

Special attention should be called to juvenile and childhood violence, since in the past 20 years empirical literature has accumulated many serious studies showing a strong association between high aggression exhibited in childhood and high aggression later exhibited in adolescence and

adulthood. In other words, it is now recognised that childhood aggression is a good predictor of aggression in later life (Astor, 1995, p.102). It should also be noted that high aggression detected at a young age is most unfortunately bound to be stable throughout development (Eron, 1987; Farrington, 1991; Huesmann et al., 1984; Olweus, 1991; Patterson, 1982). What is more, it has been suggested that high levels of aggression are as stable as IQ measures across development (Farrington, 1991; Olweus, 1984). Namely, without early intervention aggressive young children exhibiting chronic aggressive behaviours are likely to remain aggressive as adolescents and adults (Astor, 1995, p.102). If that is not bad enough one should bear in mind that serious violence is frequently part of a lifestyle that includes drugs, guns, precocious sex and other risky behaviours. Youths involved in serious violence typically commit many other types of crimes and exhibit other problem behaviours, presenting a serious challenge to intervention efforts (The Surgeon General, 2000).

SCHOOL VIOLENCE AS A SERIOUS WORLDWIDE PROBLEM

School violence, according to a new study by the International Bureau of Education is increasing at an alarming rate worldwide (Ohsako, 2001). Contrary to what is commonly thought, school violence is as much an issue in developing countries as industrialised ones; in rural areas as much as in urban neighbourhoods (ibid).

Bullying in schools, once shrugged off with a kids-will-be-kids attitude, has come to be regarded as a serious problem around the world. Ten to 15 per cent of children are bullied regularly, and bullying most often takes place in school. Facts also show – as just mentioned – that the size of the school, its setting (rural, urban or suburban) and racial composition seem to have no bearing on its occurrence (Newquist, 1997). Bullying takes a heavy toll on the victims. As many as seven per cent of Grade 8 pupils in the United States stay home at least once a month because of bullies. Chronic fear can be the source of all-too-real stomachaches, headaches and other stress-related ilnesses (ibid).

As school violence turns out to be a good predictor of aggression in later life a lot of effort has been invested in concentrated attempts aimed at evaluating the scope of this phenomenon. In 1988 some 30 experts from 15 countries met in the Netherlands for a NATO Advanced Research Workshop organized with the objective of discussing problems in measuring self-reported crime and delinquency among young people. As a result the International Self-Report Delinquency Study was started in 1990 (Junger-Tas et al., 1994).

The 1992/3 survey found that among the 16-17 year age-group in England, the Netherlands, Spain and Italy the violence figure reached 16-26 per cent (ibid). The prevalence of serious violence by age 17 years in the United States is even higher than that. About 30-40 per cent of male and 15-30 per cent of female youths report they committed a serious violent offence at some point in their lives. This cummulative prevalence is similar among African Americans and white males (The Surgeon General, 2000, ch. 3). On the whole, then, youth violence rates in the United States reach about 30 per cent.

A comprehensive survey of school violence has been carried out in recent years by the World Health Organization, and the results have been published under the title *WHO-HBSC: World Health Organization: Health Behavior in School-Age Children*. Twenty-nine countries participated in the last survey; all of which are, with the exception of Israel, in Europe or North America. The HBSC survey is conducted every four years according to the same protocol and using the same international standard questionnaire. The study was initiated in 1982 by researchers from England, Finland and Norway. Data collection within this study took place in 1983/4, 1985/6, 1993/4 and 1997/8.

Three main conclusions could be drawn on the basis of the 1997/8 survey. First, the variance in cross-cultural school violence is very large. On the one hand there is a whole list of countries in which the percentage of pupils who admitted participation in bullying or harassment of fellow pupils reached the figure of 60 per cent or more. On the other hand there is a group of countries where the percentage is under the figure of 20 per cent. Second, violence among boys turns out to be a much graver problem than among girls in all the countries participating in the study. Third, the percentage of recidivist violent pupils, who admitted they committed at least three acts of violence in their school within the academic year is dramatically lower than that of the pupils who committed less than three violent acts during the year (Harel, 1999).

The violence-prone countries (according to rank order) turned out to be Austria, Denmark, Greenland, Lithuania and Germany. In all of them the violence figure transcends 60 per cent inasmuch as pupils aged 11, 13 and 15 years are concerned. In Austria the percentage stood at 68.1; in Germany it stood at 61.2. In Israel it stood at 43.0 (Harel, 1999, p.19). The five least violent countries turned out to be Northern Ireland, Greece, Wales, Sweden and England. In Northern Ireland the violence figure reached 21.4 per cent. In England it stood at a mere 13.5 per cent (Harel, 1999, p.17).

To top it all, it is necessary to be aware of the fact that surveys carried out in different countries indicate that anxiety and fear of school violence also constitute a grave problem. Where violence is rampant parents fear for their children's physical safety in school. The extent of this problem is reflected in Table 1, based on Gallup polls carried out in the United States between 1977 and 2001.

Table 1. Fear of parents for their children's safety according to Gallup polls

Poll's date	Fear for children's safety	Don't fear	Have no opinion
August, 2001	32.0	68.0	0.0
March, 2001	45.0	54.0	1.0
August, 2000	26.0	74.0	0.0
April, 2000	43.0	57.0	0.0
August, 1999	47.0	53.0	*
May, 1999	52.0	47.0	1.0
26April, 1999	49.0	51.0	*
21April, 1999	55.0	45.0	0.0
June, 1998	37.0	62.0	1.0
1977^	24.0	70.0	6.0

Source: The Gallup Organization, 2001; Gallup Poll Topics, 2001.

The data summarized in the table reflect a basic fact: fear for children's safety varies from time to time. Yet, in so far the last few years are concerned it is quite considerable. Usually, between 40 and 50 per cent of the parents fear for their children's safety. This fear is the understandable outcome of the dramatic change in school climate. School life once resembled gentle scenes from *"Goobye, Mr. Chips"*. In recent years, however, bloody episodes have been acted in schools throughout many Western countries. Thus, for example, between 1994 and 2001 at least 37 lethal shootings have occurred in American schools, as well as many more near misses that were never reported. The deadliest school shooting in United States history left 14 students and a teacher dead in 1999 at Columbine high school in Colorado (Bowman, 2001). The days of *"Goodbye, Mr. Chips"* have long disappeared. In recent years schools have become an arena for violent conflict, even in the tranquil rural areas and well-to-do suburbia (Schneider et.al., 1998).

A few words on the link between violence and bullying are in order in this respect. To begin with, the data and reality of bullying and peer oriented school violence are so similar that many researchers use data from physical bullying, childhood violence and school violence

interchangeably (Moyer, 1987; Bandura, 1973). On the other hand, other researchers distinguish between the terms 'violence' and 'bullying', defining the latter as comprising of direct behaviours such as teasing, hitting and stealing, initiated by one or more students against a peer-victim. As is well recognised, in addition to direct attacks, bullying may also be more indirect, by causing the victim to be socially isolated through intentional exclusion (Smith & Sharp, 1994).

Amid growing concern over the connection between bullying and school violence there are some experts – like Prof. Howard Spivak from Tufts University – who are of the opinion that bullying and violent behaviour are indeed two different things, yet there is a strong relationship between them.. Bullying breeds violence. Both bullies and their victims are more likely than other children to be involved in acts of violence (Bowman, 2001). Thus, in the case of the 15-year-old youth accused of killing two students in a shooting rampage in a certain high school in California in March, 2001 classmates described him as, "a constant target of physical and verbal abuse at school". Similarly, the parents of a 14-year-old Pennsylvania girl, who shot a classmate in the shoulder at the same week, said she had been regularly brutalized by bullies (ibid). Last but not least, in the school survey mentioned above, the adolescents responding to the poll overwhelmingly ranked revenge as the strongest motivation for school shootings, with 87 per cent saying shooters want "**to get back at those who have hurt them**" (Bowman, 2001).

This awareness of school violence is also typical of Israel. A survey carried out among 1,750 Israeli respondents in 2002 indicated that 67.2 per cent of those sampled held the opinion that school violence is a much graver problem than it used to be. Of those sampled, 51.9 per cent stated that either they themselves or else some body close to them encountered violence in school. Of the parents included in the sample, 69.2 per cent stated that they feared for their children's safety in school. Of the children in the sample, 20.9 per cent stated that they feared for their safety while in school (IOL, 2002).

SCHOOL VIOLENCE IN ISRAEL

The preceding review of school violence indicates a large variance in school violence in so far as Western countries are concerned. The findings emerging from available statistical data as well as from field studies carried out in Israel indicate that school violence constitutes a grave problem both in absolute and relative terms. In fact, the problem is graver in Israel than in most Western countries. Moreover, the problem is going from bad to worse. Statistical data indicate that the growth in school violence between the years 1995 and 1999 was very sharp. In fact, the growth in school assaults handled by police amounted to 93.5 per cent; the growth in aggravated assault cases handled by police amounted to 26.2 per cent; and the growth in cases of grave injuries caused by assaults handled by police increased four-fold (436%) (National Council for Child's Welfare, 2000).

The huge surge in violence offences committed in the school system in recent years and depicted in Table 2 reflects *inter alia* the Israeli morbid reality. Although studies on aggressive and violent behaviour among Israeli children and youth are not numerous, there is a consensus among researchers that aggressive and violent behaviour has become a part of daily routine (Hochman, 2000). Israeli children most unfortunately grow up in a political and socio-cultural climate in which conflict is handled by hostility and aggression (Elbedour, 1998). Given the utilization of aggression in the national context of escalating conflict one can expect to observe the effects on aggression and violent behaviour among Israeli children and youth (Klingman et al., 1993). Violence breeds violence.

According to a police report to the Knesset (Israeli Parliament) 2,760 criminal files were opened for juveniles in the year 2000 for school violence as against 2,633 in 1999 (Ha'aretz, 2000).

Police officers in charge of juvenile delinquency in Israel maintain that school violence constitutes a very grave problem.

Table 2. Violence offences committed by minors in the Israeli school system, 1995-1999

Offence	No. of cases investigated by police		
	1995	**1998**	**1999**
Total	928	1,383	3,034
Assault	803	1,235	2,390
Assault on school staff members	15	21	87
Aggravated assault	60	71	257
Grave injuries caused by assaults	50	56	300

Source: National Council for Child's Welfare, 2000

In 1990, a 3,415 person sample survey was carried out, encompassing pupils in 15 high schools in greater Tel-Aviv, Netanya (a medium size town, 30 km. North of Tel-Aviv) and Beer Sheba (the capital of the Negev in the Southern part of Israel). It tried to track down the patterns of juvenile delinquency in various youth activity foci such as clubs (including Youth Movements), community centres, cinema theatres, sport clubs, cafes, pubs, discotheques as well as schools (Horowitz and Frenkel, 1990). The findings were very illuminative.

As it turned out schools constituted the main violence focus. Schools turned out to be more violent than clubs, community centres, cinema theatres, sport clubs and sport grounds, pubs, cafes and even discotheques. In so far as verbal abuse, bullying, threatening, beating, purposely pushing, stabbing, score settling, blackmailing, inflicting injury and property-damaging were concerned, school premises turned out to be far worse than all the other activity foci (Horowitz and Frenkel, 1990, pp.75-86). Sixty per cent of the surveyed boys and 40 per cent of the surveyed girls admitted involvement in verbal abuse. A third of the boys and more than 10 per cent of the girls admitted involvement in physical violence (op. cit., p.265).

In the very same year another comprehensive survey was carried out in Tel-Aviv, encompassing a 8,931 person sample of Grades 5 and 6 students in secular, religious and Arab schools (Dgani & Dgani, 1990). Its aim was to gauge school violence in Tel-Aviv, and study its characteristics, types and frequency. The survey also included 460 teachers who were in direct contact with the surveyed pupils. The main findings were as follows.

- About 19 per cent of the surveyed pupils (32 per cent in the Arab schools) reported high or very high incidence of violence in their schools. Another 40 per cent defined the incidence of violence in their schools as intermediate. In other words, about 60 per cent of all pupils indicated that school violence was a real problem where they learned.

- At least 2-3 pupils in every class (6% of all the pupils) knew at least five pupils in their own class who lived in constant fear of threats and beatings – the most common manifestation of violence on school ground.

- Of the reported incidents, 45 per cent were not perpetrated by children constantly prone to be violent. However, 30 per cent of the incidents could be definitely ascribed to persistent offenders.

- Only about 27 per cent of all violent incidents were reported to teachers and headmasters. The great majority of the cases never reached their attention.

- The response of the school administration to the reported incidents turned out to be as follows: In about 10 per cent of the cases no action whatsoever was taken against the offenders; in 42 per cent a warning was issued to the guilty parties; in 32 per cent of the cases the culprits were punished.

- Boys suffered from violence to a much higher extent than girls (ibid).

The main lesson to be learned from this survey is, as mentioned above, that 15 per cent of the pupils are under constant threat while in school. Moreover, teachers and headmasters are unaware of the great majority of the incidents that happen, so to say, 'under their noses'. Therefore no action whatsoever is taken against the offenders in most cases.

Another comprehensive survey carried out on a national representative sample of sixth to eleventh graders illustrated once again a rather unhappy picture at the end of the 1990s (Harel et al., 1998). It turned out that more than 50 per cent of the surveyed pupils were bullied at least once one way or another during the school year. The lower age-groups were more liable to fall victim to violence. Of the students in Grades 6 and 7, 68.7 per cent of the boys and 53.2 per cent of the girls were victimised at least once during the year. In Grades 10 and 11, 48.3 per cent of the boys and 28.6 per cent of the girls reported that they fell victim at least once to an act of violence in the school (ibid.).

At the same time it turned out that 21.6 per cent of the pupils were victimised three times and more during the school year. Here again, the younger children suffered more than their seniors. Of the sixth and seventh graders, 35.7 per cent of the boys and 21.2 per cent of the girls reported they were victimised, while in the tenth and eleventh grades, only 17.8 per cent of the boys and 11.8 per cent of the girls made similar allegations (ibid).

As to active participation of the children in violent acts against their peers, the survey indicates that about 45 per cent of the sixth to eleventh graders molested other pupils in their school at least once during the survey's year. Of those surveyed, 17 per cent admitted they were involved in violent acts against their peers three times or more during the same period (ibid).

Things are not very much different in so far as physical violence or beating is concerned. Almost half of the sixth to eleventh graders (48 per cent) reported that they had been involved in physical fights in their school at least once. Among the sixth to eleventh graders the percentage was much higher than among their seniors. Of the lower age-groups, 79.7 per cent boys and 32.2 per cent of the girls reported involvements in physical fights, as against 56.9 per cent of the boys and 16.8 per cent of the girls in the higher age-group (ibid).

It is interesting to note that the involvement of veteran Israelis or Israeli-born children in physical violence is higher than that of the new-comers or immigrants (Immigrants who entered the country in the last ten years constitute about 20 per cent of the Jewish population in Israel). Of the old-timers or *Sabras* (Israeli-born), 48.8 per cent were involved in physical fights as against a mere 37.0 per cent of the new-comers (ibid).

The violence depicted by the survey has not been exhausted. On top of all that has been mentioned so far, it should also be noted that 14.4 per cent of the boys and 8.1 per cent of the girls in the sixth and seventh grades stated that they fell victim to what would be termed in plain language as robbery by other kids. Of those in the higher age-brackets, 7.3 per cent boys and 4.7 per cent of the girls were similarly robbed in school. Furthermore, 14.6 per cent of the boys and 6.6 per cent of the girls in the sixth and seventh grades, and 6.2 per cent of the boys and 4.5 per cent of the girls in the tenth and eleventh grades reported that they were physically attacked by peers using clubs, knives or other harmful objects. These cases fall under the definition of serious violence.

Furthermore, the available data suggest that about 9 per cent of the sixth to eleventh graders were injured and had to be medically treated at least once during the school year as a result of involvement in scuffles. The grim situation is reflected in another finding of the survey: About 15 per cent of the sixth to eleventh graders reported carrying weapons into school for self defence at

least once during the month preceding the survey (22.6 per cent of the boys; 6.6 per cent of the girls). Mostly, though, it was not firearms but rather knives, pen-knives, clubs, knuckle-dusters.

It should be reiterated in this respect, that the international survey mentioned above (Harel, 1999) indicates that Israel is counted among the most violent countries of those surveyed. The school-violence coefficient found in Israel turned out to be higher than these found in Russia or the United States, two countries whose stereotype is most violent.

As far as taking part in bullying, harassment or pestering in school grounds is concerned, Israel is in the eleventh place, right after Belgium and just above Russia. The percentage of children involved in this kind of violence in Israel is 43.0 as against 49.3 in Belgium and 41.6 in Russia (Harel, 1999). As far as recurrent participation in bullying, harrasment or pestering on school grounds is concerned (three time or more during the school year) Israel is again in eleventh place, right after Estonia and just above France. The percentage of pupils counted in this category in Israel is 18.8, as against 19.2 in Estonia and 18.2 in France.

The grim Israeli situation is fully reflected in the most comprehensive and recent survey to date, carried out in two stages in 1998 and 1999 and encompassing 32,246 sixth to eleventh graders in 1229 classrooms, as well as 1509 teachers and 197 school headmasters (Benbenishti et al., 2000). It is interesting to note that the picture drawn by the pupils was much grimmer than that drawn by either the teachers or the headmasters. Which only serves to show how insensitive the latter are to the problems facing the school system. About 80 per cent of the elementary school and junior high school children and 65 per cent of the high school children reported having been verbally abused by their peers during the last month prior to the survey. Two thirds of the elementary school and junior high school children and half of the high school children reported that they have been mocked, insulted or humiliated by their peers during the same period (Benbenishti et al., 2000, IV). About a quarter of the junior high school and high school children surveyed reported involvement in scuffles that were the result of either ethnic tension or else the eruption of tension between new-immigrants and old-timers, or a collision between members of different hamulus (in the Arab schools).

Inasmuch as physical violence is concerned, about 85 per cent of the elementary school children, 50 per cent of the junior high school children and a third of the high school children reported they were pushed around by their peers at least once during the last month prior to the survey. About 16 per cent of the high school children, 32 per cent of the junior high school children and 48 per cent of the elementary school children reported having been kicked or beaten at least once during the same period (ibid).

On top of that, about a half of the elementary school children, a third of the junior high school children and a quarter of the high school children reported they were threatened by their peers at least once during the same period. 6.8 per cent of the elementary school kids, 7.2 per cent of the junior high school kids and 5 per cent of the high school kids reported that they were threatened by peers holding a knife or a pen-knife. Of the junior high school and high school kids, 8 per cent reported they were threatened by gangs in the school. And finally, 3 per cent reported they were threatened by a peer flashing a gun (ibid). Without going into details it is necessary to bear in mind that this picture is much grimmer than the findings of the parallel comprehensive survey carried out in the United States (Furlong et al., 1997). On all accounts mentioned in both surveys – involvement in beatings, scuffles involving injuries, use of stones to inflict harm, kicking or boxing, threatening with knives – the situation in Israel turns out to be much worse than in the United States.

Small wonder, then, that public opinion in Israel is very skeptical about the steps taken by various state agencies in order to curb violence in the schooling system. In the 2002 survey 65.9 per cent

of the respondents held the opinion that the steps taken in the schools were too late and too little. Only 2.3 per cent deemed those activities good and beneficent (IOL, 2002).

VIOLENCE AS THE LIABILITY OF THE SCHOOL SYSTEM

A very grim picture of violence both in absolute as well as in relative terms emerges from the data cited so far. The ensuing question is twofold, namely, what is the school's contribution towards this violence, and how can one fight against this phenomenon.

Without going into a detailed discussion in order to gain new insights into violent behaviour in the school and increase understanding of the complex reasons leading to it, it might best be stated briefly, that school violence is usually attributed to three main causes (Horowitz, 1989).

- The influence of the aggressive streaks prevalent in the Israeli society at large. Schools do not exist in a vacuum; they are a reflection of their society. A violent society gives rise to violent schools (see also Admati Institute, 1998). Violence in the Israeli schools is to be seen as an integral part of the negative changes occurring in the Israeli value and normative system. It is, as said, the outcome of prevalence of violent behaviour in the Israeli society of the 1990s.

- The unique school climate and experience: estrangement and alienation typical of large schools; stressful organisational climate; weary, worn-out teachers; prevalence of behavioural norms regarded by the pupils as unfair (see also Smith and Sharp, 1994). School climate offers a significant potential for enhancing both understanding and prevention of school violence (see also Welsh, 2000).

- Situational factors resulting from the context in which the school is functioning; change in the school administration accompanied by installation of new educational concepts; intensive turnover of the school staff; intensive absorption of immigrant pupils and minority groups.

There is no doubt that the school exerts a great deal of influence on children due to the mere fact that they spend a lot of their time on school grounds. Schools can be a risk factor when violent behaviour is prevalent there. Conversely, schools can also be protective and safe, enhancing efficient adjustment and counteracting negative social influences (Baker, 1998; Garbarino et al., 1992).

In this respect one should be aware of the fact that school violence might be attributed to a large extent to the failure of community spirit there. It is the result of a crisis in the sense of identity and belonging of the pupils (ibid). In schools where the sense of belonging and commitment is strong, violence constitutes no problem. When schools do not impart their pupils with meaningful social contexts; when the school atmosphere is perceived as hostile or threatening one may expect violent behaviour (ibid).

This assumption that violence is environmentally caused; that it is not a born trait but rather an acquired one is also stressed by criminologists (Adad, 1993). According to this theory violence is the result of absorbed and adapted environmental influences. The environment exerts a great deal of influence on violence. Since the environment is a primary factor contributing to violence, socialisation – and the school as an important socialisation agent – has a very important role to play in promoting tolerance, acceptance and non-violence among children (ibid). Hence the conviction that communal and humanistic school climate, encouraging the pupils to take part in the decision-making process in the school may contribute greatly to reducing school violence (Friedman, 1993; Admati Institute, 1998; Baker, 1998; Hyman & Perone, 1998).

A FEW WORDS ON INTERVENTION AND VIOLENCE PREVENTION PROGRAMS IN SCHOOLS

In view of all that has been said so far, there is no wonder that many countries, including Israel, developed intervention programs intended to prevent or at least reduce school violence. The two leading countries in this respect are Norway and England.

The first and best known intervention to reduce bullying among schoolchildren had been launched by Prof. Dan Olweus in Norway. Inspired by the suicides of several severely victimised children, the government supported the development and implementation of a comprehensive program to address bullying among children in school. The four goals of the program included (a) to increase awareness of the violence problem and knowledge about it; (b) to achieve active involvement on the part of parents and teachers; (c) to develop clear school rules and procedures against bullying behaviour, and (d) to provide support and protection for the victims (Olweus, 1991).

The program involved interventions at multiple levels (Olweus, 1993);

- School-wide interventions. A survey of bullying problems at each school, increased supervision, school-wide assemblies, and teacher in-service training to raise the awareness of children and school staff regarding bullying.

- Classroom-level interventions. The establishment of classroom rules against bullying, regular class meetings to discuss bullying at school, and meetings with all parents.

- Individual-level interventions. Discussions with pupils identified as bullies and victims.

The Norwegian project encompassed 130,000 children aged 8-16 years in a representative sample of 715 schools. Just before the project had been launched it was found that 15 per cent of the children in these schools were involved in bullying incidents; 5 per cent were involved in serious incidents. Within two years of implementation both boys' and girls' self-reports indicated that bullying had decreased by half. These changes in behaviour were more pronounced the longer the program was in effect. Moreover, pupils reported significant decreases in rates of truancy, vandalism and theft as well, and indicated that their school's climate was significantly more positive as a result of the program (ibid). The project also indicated that the decrease of violence on the school's grounds has not caused what the criminologists term 'crime transfer' into other arenas.

In short, the project has been regarded as a great success.

The British project is headed by Smith and Sharp (Smith & Sharp, 1994; Sharp & Smith, 1994). It encompassed 24 schools as well as control groups in Sheffield. Like the Norwegian program it was meant to address bullying among children in school and decrease the level of violence there. The balance of the project two years after it had been launched indicates that indeed it exerted a major influence on the decrease of bullying . There were far less perpetrators and far less victims. Also, the self-image of the pupils was strongly influenced in a positive way.

This project too is therefore considered to have been a great success.

Needless to say that Israel has also launched numerous programs aimed at decreasing school violence. Some of them were developed by different departments at the Ministry of Education. Others were developed in the schools themselves by the school staff and administration. Yet others were developed by academic institutions and public and private professional bodies. Although all the programs were aimed at decreasing school-violence they differed in their scope,

target-population, focus, and the number of partners responsible for their implementation (Noy & Rokach, 2001).

As early as 1989 the psychological consultative service of the Ministry of Education published a booklet containing a host of intervention programs aimed at decreasing violence levels in school (Rokach, 1989). They were developed by different schools and contained detailed instructions for school mobilisation in the fight against violence, as well as detailed work-models and the like. On the whole, the booklet recommends a complex attitude, containing pinpointing the unique difficulties faced by the school; study of their causes; debating possible solutions and working-out a specific intervention program in line with the concrete needs of each particular school. The emphasis is on the exclusiveness of the unique programs. There are no standardised programs embracing all the schools. As formulated by the authors (SHEFI, 2001), "The intervention program has to be specifically matched to each school. Each school has first to undergo a diagnosis; its strong and weak points have to be analysed and evaluated. Only then a program should be devised and launched."

A FEW INITIAL NOTES ON A CERTAIN INTERVENTION PROGRAM IN A MEDIUM SIZE TOWN IN GREATER TEL-AVIV

As already mentioned there is no shortage in Israeli intervention programs aimed at decreasing school violence. In fact, the problem is not the availability of programs but rather their suitability and effectiveness. The question is to what extent have they managed to achieve their goals.

The Paper tries to analyse one particular such program as a case in point. It was developed in a junior high school in a medium size town in the metropolitan area of Tel-Aviv. Its target population was the seventh graders in the school. The analysis has been carried out under my guidance and supervision in 1996 (Tiqva, 1996).

This particular intervention program has been chosen as a case study since it was regarded by the school professional staff as the right answer to the school's pressing need. It was not imposed on the school by an outside agent; rather, it was conceived and developed in the school itself. Moreover, this program has also been chosen as a case study since it focuses on the pupils. It targeted their cognitive variables. It did not target school variables: it did not have in mind, the training of all the people in the school setting, teachers, support staff, parents. Also, it did not include multiple-level school-wide interventions. It attempted to change the children's attitude regarding violence through tackling cognitive or skill variables.

Hence, what characterises this case study is on one hand, simultaneous implementation of several programs (most of them devised by the Ministry of Education) trying to cope with school violence. On the other hand it is also characterised by a lack of systemic targeting of the school's variables. Finally it is characterised by a blitz attitude. While the Norwegian and British programs spread out over an 8 to 20 months period, this case-study program was built around ten meetings of two-hours each. The underlying assumption of the program was that learning through group experience encourages personal involvement and commitment. It also facilitates self-consciousness and development of new behavioural patterns (Tiqva, 1996, p.41).

The main question is whether under these circumstances the intervention program actually succeeded in reducing violence in the school.

Among the goals usually recommended by experts and mentioned in intervention programs one finds the increase of awareness of the violence problem and knowledge about it; development of clear school rules and regulations relating to students' discipline and intended against bullying behaviour; discussions aimed at promoting 'alternative behaviour patterns', namely substitution of

angry and violent behaviour by appropriate alternative behaviour; and last but not least, improvement of the school's climate, both on the institutional level as well as on the class level and the interpersonal level (Katz & Pazi, 1997, pp.14-15).

One of the questions posed while attempting to evaluate this particular intervention program was whether these universal targets were included in it, and to what extent (Tiqva, 1996, pp.46-75). Contents analysis of the ten 2-hours meetings as crystallised in the program indicates that it covered three out of the four universal goals recommended by the Ministry of Education. The subject treated most extensively was the increase of awareness of the violence problem. Six out of ten meetings were devoted to it (although one of the meetings also tackled the second subject). The prevailing attitude was that it is definitely possible to reduce bully and victim problems in the school. Yet, a pre-condition necessary in order to achieve desirable changes is a better awareness of the problem. The subject was treated through film-watching (followed by discussions and analyses), lectures given to the pupils by experts, as well as case analyses.

Three meetings have been allocated to the second subject – school rules and regulations relating to discipline and norms of behaviour. It too was treated with the help of case analyses, filling of questionnaires followed by their analyses through group discussions; and last but not least – formulation of rules and norms of behaviour in the class forum, following suggestions of the pupils themselves.

Two meetings have been allocated to treating the third subject, namely promotion of alternative patterns of behaviour. The first meeting concentrated on constructing the personal profile of each one of the pupils. Later on ways and means of treating violent streaks existent in these profiles were discussed and recommended. The second meeting was built around analyses of case studies (carried out in small groups), followed by a general discussion of the case studies in the class forum. Table 3 provides a summary of the subjects treated in the intervention program and the tools used in the program.

Table 3. The subjects treated in the intervention program and the tools applied

The Subject	No. Of Meetings	Meetings Sequence	Tools Applied
Deepening awareness of violence analyses; films	6	2,3,4,5,6,8	Questionnaires & discussions; lectures; case-studies.
Discussions of school rules and regulations; formulation of behavioural norms	3	6, 9, 10	Task and case studies analyses; questionnaires & their analyses; discussion & formulation of recommendations
Discussion of alternative patterns of behaviour	2	1, 7	Profile construction; case studies Analyses & class discussion

THE GROUPS SURVEYED AND THE QUESTIONS POSED IN THE SEVENTH GRADE

It is noteworthy that out of the four recommended targets of the intervention programs one was omitted advertently or inadvertently: changing the school-culture regarding violence.

As already mentioned, it appears that the particular intervention program studied here suffers from two major flaws. First, it does not apply a systemic approach. Rather than conceptualise components of the program at the school level, the classroom level and the individual level, it is limited to the class and the individual levels. Moreover, not all the existing school environments were included in the program. Parents were not actively involved; neither were social workers and psychologists. Second, not all the recommended targets were tackled to begin with.

As part of the evaluation an attempt has been made to survey a sample of the seventh graders in the school – the focus of the intervention program. In actual fact two separate groups were analysed in the survey:

- an experiment group (27 pupils), which took active part in the sessions of the intervention program; and

- a control group (32 pupils), which did not participate in the project.

All in all, 59 pupils (all of them seventh graders) responded to the written questionnaire at the end of the ten sessions devoted to the intervention program. The questionnaire contained 12 questions dealing directly with the problem of school violence. It also contained additional questions concerned with violence generally or with inappropriate behaviour. The latter were meant to help illustrate the general social climate constituting the framework in which the children function.

The 12 questions dealing with school violence were subdivided into two subgroups:

- The first subgroup (four questions) was meant to supply information regarding the scope of bullying and violence on the school grounds;

- The second subgroup (eight questions) was meant to supply information about the pupils' attitude toward school violence.

The first subgroup contained the following questions:

- Are you aware of any vandalism case in your school?

- Has such a case of vandalism happened in our school this year?

- Have you been present in any case when school property was wilfully damaged this year?

- Are you aware of any pupils in your class or grade who threaten other pupils and extort money or any other objects or articles from them?

The second subgroup contained the following questions:

- Recently a complaint-box has been nailed in the school corridor. Pupils are encouraged to lodge complaints against abusing, threatening and beating peers. What is your opinion about that?

- If you happened to witness a case of vandalism in the school have you tried to prevent it at all?

- Suppose you happened to know of a classmate or somebody in your grade who threatens another classmate or tries to extort him – how would you react?

- Some pupils think that bearing in mind the prevailing insecurity in Israel it is advisable to carry a knife or a penknife for self-defence. What is your opinion of this?

- Suppose you happen to find out that a classmate or a grade fellow of yours has been abused, humiliated or beaten. How would you react?

- In which of the following episodes will you address a teacher or some other authority at the school management level :
  - when you happen upon a beaten or abused pupil;
  - when you happen to witness pupils vandalising your school property;
  - when you happen to know that a fellow-student of yours consorts with delinquents.

The information collected from the survey justifies in principle the introduction of an intervention program into the school, since it reflects the violent reality prevailing there. Of the surveyed pupils, 55.9 per cent reported that they witnessed vandalism in the school at least once during the last year; 87.7 per cent reported that they were aware of the fact that cases of vandalism happened in the school occasionally; 50 per cent reported that they were aware of cases of threats and extortion in their school; 5.8 per cent stated that it happened to a friend of theirs; 5.8 per cent reported that it actually happened to them.

Harassment happens to be a most common occurrence in the school. Of the surveyed pupils, 84.9 per cent reported that they knew a pupil in their own class or grade who was regularly harassed, humiliated or beaten, 9.4 per cent said it happened to a friend of theirs, and 5.7 per cent declared it actually happened to them. The pupils' answers imply that aggressive behaviour really constitutes a problem in the school.

The key question in this respect is, 'what do the pupils think about the intervention program devised by the school?' Do the students in the experiment group differ in their opinion and attitude from the students in the control group? And if yes, in what way or ways?

INDICATORS OF FAILURE

Since the questionnaire was administered to the pupils at the end of the ten blitz sessions comprising the program, the answers could be taken as a good indicator of the effect of the intervention program as a whole. A statistically significant difference between the two groups could at the very least mean that another check is justifiable. The results of the analysis of these data are presented in Table 4, which gives data on pupils' attitudes towards school violence according to specific categories and groups.

Table 4. The pupils' attitude towards school violence according to categories and groups

Category	Experimental group		Control group	
(values are in per cent)	Active stand against violence	Indifference	Active stand against violence	Indifference
Attempt to prevent equipment destruction	52.9	47.1	61.5	38.5
Taking a firm stand against threatening & extorting pupils	85.2	14.8	75.9	21.1
Coming across a beaten and humiliated pupil	84.6	15.4	81.3	18.7
Coming across vandalism in the school	25.9	74.1	36.7	63.3
Catching a pupil in a stealing act	33.3	66.6	45.2	54.8
Coming across a pupil consorting with delinquents	26.9	73.1	25.0	75.0
Coming across a pupil carrying arms in school	64.0	36.0	51.6	48.4
Taking a firm stand against beating & abusing pupils	62.9	37.1	75.1	24.9

Yet, the analysis of the answers points at a different reality. It turned out that in four out of eight relevant questions[1] the answers indicated that the control group demonstrated a much stronger attitude against violence than the experiment group. Indeed in four out of the eight questions[2] the experimental group demonstrated a stronger attitude than the control group. However, it should be

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[1] The question relating to an attempt to prevent equipment destruction; the question dealing with the stand taken upon coming across vandalism in the school; the question dealing with the stand taken upon catching a fellow-student in a stealing act; and finally, the question relating to the stand taken against beating and abusing fellow-students.

[2] The question dealing with the stand taken against threatening and extorting students; the question dealing with the stand taken upon coming across a beaten and humiliated student; the question dealing with the stand taken upon coming across a fellow-student consorting with delinquents; and finally, the question dealing with the stand taken upon coming across a student carrying arms on the school premises.

noted that in two out of these four questions[3] the difference between the two groups was statistically insignificant.

An attempt to translate these data into a common denominator sharpens the picture. By constructing a binary scale allotting 10 points to each answer taking a stand against violence, and 0 points to each answer indicating indifference one arrives at an interesting result. The average score of the experiment group turned up to be 544.6 points, whereas the average score of the control group was 565.4.

In other words, contrary to what could be expected, it turned out that the control group scored higher than the experimental group. In plain words it means that the control group took a firmer stand against violence, although the difference of 20.8 points (or 3.8%) between the two groups is not statistically significant. Nevertheless, the inevitable conclusion is that the intervention program failed to change the pupils' attitude towards violence.

PUPILS' SUGGESTIONS AND RECOMMENDATIONS

On top of all that has been said so far, it should be borne in mind that the indifferent students were numerically very prominent in both the experimental and the control groups. As far as the experiment group is concerned, in six out of the eight questions mentioned above the indifferent constituted more than 35 per cent of the respondents. In three out of the eight questions their weight amounted to 65 per cent. As far as the control group is concerned the picture is not very much different.

And yet, when the question was posed what should be done in order to further curb school violence, 45 per cent of the surveyed pupils, in both groups, stated that the intervention program was an efficient means. Of the entire alternative answers this was the one adhered to by the largest number of pupils. The second most popular suggestion turned out to be stricter enforcement of discipline, order and the punitive system in the school.

It is interesting to note here that the systemic approach based on cooperation between teachers, parents and students was the third popular answer. It seems that the pupils see eye to eye with the experts in this respect. In fact, what the pupils say in simple language is that pro-active programs contribute to the improvement of the school climate as well as to changing the circumstances contributing to violence. They also embrace the notion that these programs have to be implemented simultaneously at the individual's level and the systemic level (Noy & Rokach, 2001, p.44).

A review of the pupils' answers serves to show that some of the suggestions were common to both groups, and some were typical of one but not of the other. Table 5 presents the breakdown of the suggestions put forward by the experimental group. It also shows the amount of support some of these suggestions gained in the control group.

Even a cursory study of the suggestions put forward by the experimental group points at another noteworthy conclusion: the students' awareness of the fact that a great weight should be assigned to the school climate in so far as prevention of violence is concerned. In this respect they concur with the experts who have for a long time maintained that schools, like people, have their own characteristic personalities or climates. Hence, school climate offers a significant potential for enhancing both understanding and prevention of school violence (Welsh, 2000).

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[3] The one dealing with the stand taken upon coming across a beaten and humiliated student; and the one dealing with the stand taken upon coming across a student consorting with delinquents.

Table 5. Different ways and means suggested by the pupils in order to reduce school violence

The suggestion (values are in per cent)	Experimental group	Control group
Implementation of the intervention Program in the school	44.4	43.8
Stricter discipline, order and punitive system	40.7	25.0
Cooperation between teachers, parents and Pupils	11.1	9.4
Starting implementation of the intervention Program at a lower age	11.1	
More advertising placards and relevant TV programs	7.4	9.4
Deeper inputs of teachers in pupils Excommunicated by their peer-group	3.7	
Talking nicely to the pupils	3.7	
Specific treatment of each problem as it arises	3.7	
Treating all violent acts equally	2.7	
Be sympathetic to violence victims	3.7	
Mutual encouragement and strong will-power	3.7	
Banish the violent students from school	3.7	
Handing over of the violent pupils to the police	3.7	3.1
Notto quarrel, not to meddle, address The teacher	33.3	21.9

Again, it is also noteworthy that seeming to recognize the advantages of combining macro and micro intervention strategies the pupils in fact embrace what some professionals termed 'whole school policies', that encompass the involvement of all central characters (Tattum & Tattum, 1992).

Nine out of the 14 suggestions put forward by the pupils in the experiment group deal directly with what could be aggregately be termed as school climate (2, 3, 6, 7, 8, 9, 10, 11, 14). Finally, it should be noted that 74 per cent of all the pupils in the experimental group reported that the atmosphere in their class was pleasant. 18.5 per cent defined it as exciting.

The anti-violence intervention program was, therefore, introduced into a school whose predominant atmosphere was positive rather than mean and negative. The answers to the questionnaire reflect in this sense a rather rosy picture. This fact makes the program's inefficiency even less tolerable.

All the data analysed above help in evaluating the intervention program subjectively, based on the subjective gut feelings of the pupils, who are the object of the school violence and the natural consumers of the intervention program. An objective evaluation of the program's effectiveness should be based on an analysis of sequential data relating to the school violence over a period of at least 5 to 10 years. Thus, contrary to the impression of the general public, careful study of objective data in the United States reveals that the overall risk of violence and injury at school there has not changed substantially over the past 20 years. This, despite the fact that both students and their parents report being increasingly apprehensive about their schools (Public Health Service, 2000).

Most unfortunately such data do not exist in our school. As already mentioned a comprehensive survey of the Tel-Aviv education system revealed that only 27 per cent of the violent incidents are reported to the teachers and the school management (Dgani & Dgani, 1990). Yet, the survey did not try to find out how many of the reported violent incidents were recorded, so that they could eventually be followed-up. There is no doubt that most Israeli schools document in one way or another only severe cases of violence occurring on their grounds. Comprehensive, all-embracing documentation is very rare indeed.

In the school surveyed in our case study only physical violence that necessitated medical attention was recorded. Even these cases were not documented according to consistent formal criteria. There is no way, therefore, to state unequivocally that the recorded incidents were really the only

ones that should have been recorded. Since the validity of the data is very dubious, no attempt has been made to analyse it.

All in all there are three important lessons to be learnt from this discussion. First, the students as a whole were very much in favour of an intervention program intended to help curbing school violence. Second, both students' groups favoured a systemic approach involving teachers, parents and students (an approach recommended by the experts in the first place…). Third, it is apparent that despite the school management's willingness to do something serious about violence and bullying it did not take all the necessary steps to do it properly.

SUMMARY

The article tried to evaluate a specific anti-violence intervention program implemented in an Israeli junior high school not far from Tel-Aviv. It treated it as a case study. The article started by drawing attention to the strong association between high aggression exhibited in childhood and severe forms of aggression and delinquency later in life. It also stated that overall it is now accepted that school violence is increasing at an alarming rate worldwide. School violence, it was maintained, constitutes a problem in many countries, although the variance is rather big – there are countries where 60 per cent or more of the students admitted participation in bullying or harassment. On the other hand there are countries where the percentage is less than 20.

Following that, an attempt has been made to depict school violence in Israel. Attention has been drawn to the fact that schools turn out to be more violent than clubs, community centres, cinema theatres, sport clubs, sport grounds, pubs, cafes and even discotheques. It was pointed out that 60 per cent of the students regard school violence to be a major problem. A warning has also been issued that about 15 per cent of the Israeli students are constantly verbally abused, bullied, threatened, harassed or beaten. Citing several international surveys the paper stated that Israel turns out to be one of the more violent countries where schools are concerned.

Thereafter the article turned to focus on the case study. It explained that the intervention program implemented in the junior high school was a cognitive one, focusing on the students and lacking a systemic targeting of the school's variables. The program's rationale was discussed, and its underlying assumption and goals were duly analysed. A description of the evaluation process, which was based on a questionnaire administered to a sample of seventh graders in the school, followed.

Based on the analysis of the pupils' answers to the questions posed the article arrived at the conclusion that the intervention program failed in meeting its goals. All in all, the article drew attention to the fact that where school violence is concerned there is an urgent need to start building a systematic data bank in the Israeli schools. It is imperative in order to facilitate an efficient follow-up of both the violence and the intervention programs. Systematic data collection and recording is greatly needed at all levels, starting with the school, moving through the locality and ending at the national level. It is impossible to evaluate properly the intervention programs currently administered when there is no data bank. Lack of proper evaluation is likely to impinge on the effectiveness of the programs.

The case-study analysed in the article is typical of a host of similar programs implemented in other schools all over the country. School violence is too big and serious a problem to be treated the way it is now treated. It is both a sheer waste of resources as well as a misguided illusion: the initiators and the other parties involved with the programs are under the impression that they are effective. In fact, a great many of them are not.

To sum up, the article reiterated a well-established fact, namely, that aggression occurs in school all the time. Teachers (and sometimes, parents too) are unaware of the problem's extent, and many students are either reluctant to get involved or are at a loss as to how to help (Charach, Pepler & Ziegler, 1995). Given this situation the need is emphasised (Smith & Sharp, 1994) to develop whole-school policies and embrace the systemic approach (Olweus, 1993). One of the foremost conclusions of the case-study analysed above is that a lot of work has to be done with the school-master as well as the school stuff as a whole. They should have a ready access to professional consulting stuff made available to them by the Ministry of Education (Admati Inst., 1998). This is a pre-condition to implementing effective intervention programs.

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