The application of multiple intelligences in two year 7 textile technology classes

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Abstract
In a teaching and learning environment that embraces innovation, inclusion and effectiveness, it is essential to acknowledge students' individual learning styles to promote optimum learning. While multiple intelligences (MI) theory considers students' interest, it has been more often applied in teaching mathematics, science and music subjects. This study applied the theory of MI within two year seven textile technology classes. Data were collected from student group assessments, surveys and daily engagement levels. The results of the study show that groups whose members shared similar MI reported having a more positive experience than groups that were not specifically MI assigned. Further, those groups including different MI sets were observed to be slower to commence an assigned class task, but developed a deeper understanding of class objectives as they encouraged, motivated and worked collaboratively together. Designing intentional teaching styles and explaining tasks for different MI resulted in more students knowing what was expected of them and fewer questions about the tasks.

> *Each student is intelligent then in their own unique way.*

Introduction
Learning is unique and personal. However, while individual student learning profiles might vary, it is argued that all children are "smart" in some areas (Gottfredson, 2004). A current trend encourages teachers to be more intentional about their teaching styles so as to promote student learning, as evidenced by the United Nations promotion of educational reform and inclusive education (UNESCO, 2001; WHO, 2011).

Historically, the traditional idea of intelligence focused mainly on linguistic intelligence and logical-mathematical intelligence as reflected in earlier educational realms including, the capacity to think, the ability to make a logical inference, and to store and retrieve information (Sulim, 2012).

Gardner (1983) challenged this traditional stance. His intelligence definition: "suggests that intelligences are not things that can be seen or counted. Instead, they are potentials – presumably, neural ones – that will or will not be activated, depending upon the values of a particular culture, the opportunities available in the personal decisions made by individuals and/or their families, schoolteachers, and others" (p. 33). Each student is intelligent then in their own unique way. This is dependent, in part, on the opportunities they are given and the culture in which they abode. Initially, Gardner outlined seven intelligences in his first book Frames of Mind (Gardner, 1983), however, after further research, two additional intelligences were added as outlined in Intelligence Reframed (Gardner, 2000). The nine intelligences are: linguistic, logical-mathematic, spatial-visual, bodily-kinaesthetic, musical, intrapersonal, interpersonal, naturalistic and existential. A description of each follows.

Linguistic/verbal intelligence
This intelligence reflects the "ability to use words effectively, orally or in writing" (Pienaar, Nieman, & Kamper, 2011, p. 268), and the "production of

language, abstract reasoning, symbolic thinking, conceptual patterning, reading and writing" (Stanford, 2003, p. 81).

Logical/mathematical Intelligence

This form of intelligence involves the capacity to recognise patterns, work with abstract symbols (e.g. numbers, geometric shapes), and discern relationships or see connections between separate and distinct pieces of information (Stanford, 2003). It includes "sensitivity to logical patterns, relationships, statements, propositions (cause and effect) and similar abstractions. It includes, categorising, classifying, inferring, generalising, testing hypotheses and calculating" (Pienaar, Nieman, & Kampter, 2011, p. 269).

Visual/spatial intelligence

This form of intelligence involves the "ability to observe the visual and spatial world with accuracy, and to apply changes or transformations to these observations. It includes sensitivity to colour, line, form and space, and to the relationships between them" (Pienaar, Nieman, & Kamper, 2011, p. 269). It also relates to "navigation, mapmaking, architecture and games requiring the ability to visualise objects from different perspectives and angles" (Stanford, 2003, p. 81).

Physical/bodily-kinaesthetic Intelligence

This intelligence refers to the "skill of using the entire body to express ideas and feelings (as an actor, athlete or dancer), and of using hands to transform or create (as a surgeon or sculptor). It also includes "specific physical skills such as coordination, balance, manual dexterity, suppleness and speed" (Pienaar, Nieman, & Kamper, 2011, p. 269). Thus, it involves the body to "express emotion, to play a game and to create a new product" (Stanford, 2003, p. 81).

Musical/Rhythmic Intelligence

Musical intelligence refers to the ability "to observe, transform (as a composer), distinguish (as a music critic) and express (as a musician) musical forms", additionally, "it includes, sensitivity to rhythm, pitch or melody" (Pienaar, Nieman, & Kamper, 2011, p. 269). Further, capacities include: "the recognition and use of rhythmic and tonal patterns and sensitivity to sounds from the environment, the human voice and musical instruments" (Stanford, 2003, p. 81).

Interpersonal Intelligence

This form of intelligence involves the "ability to work cooperatively with others in a small group as well as the ability to communicate verbally and nonverbally with other people" (Stanford, 2003, p. 81). It includes the ability to "identify other people's moods, intentions, motives or feelings. It includes sensitivity to facial expressions, voices and gestures and the ability to distinguish between different kinds of interpersonal behaviour and to respond effectively to that behaviour" (Pienaar, Nieman, & Kamper, 2011, p. 269).

Intrapersonal intelligence

Intrapersonal intelligence reflects an understanding of the "self; a knowledge of feelings, range of emotional responses, thinking processes, self-reflection and a sense of intuition about spiritual realities" (Stanford, 2003, p. 81). This intelligence also "indicates self-knowledge and an accurate view of one's own strong points, shortcomings and limitations. It implies an awareness of inner moods, intentions, temperament and desires, and the capacity for self-discipline, self-understanding and self-respect" (Pienaar, Nieman, & Kamper, 2011, p. 270).

Naturalistic intelligence

This intelligence demonstrates the ability to "recognise patterns in nature and classify objects, the mastery of taxonomy, sensitivity to other features of the natural world and an understanding of different species" (Stanford, 2003, p. 81).

The teacher should acknowledge these multiple intelligences that each student has the ability to use. Gardner (2000) states: "Although we receive these intelligences as part of our birth right, no two people have exactly the same intelligences in the same combinations". With each student having their own unique learning style, one that no other person has, it is important to create a learning environment that provides students the opportunity to work to the best of their ability (p. 45).

Gardner also discusses two additional intelligences that of "existential" and "spiritual". These are not often included in research due to the fact that there has been insufficient evidence to measure the physiological brain evidence. However, the main point is to acknowledge and understand the individual multiple intelligences, and consequently recognise learning activities and assessments can be incorporated to create a quality-learning environment that attempts to meet every student's needs.

Outside the classroom, students will tend to rely on their own 'natural' way of learning. In the classroom, students are often asked to process learning in limited ways. "This significantly inhibits their ability to grasp the concepts and skills they need to learn to construct a substantial and permanent base of knowledge" (Silver, Strong & Perini, 2000, p. 47). Since many teaching strategies can be incorporated into the classroom, it is important for teachers to incorporate multiple intelligences into their classroom to allow students to make connections and develop

"No two people have exactly the same intelligences in the same combinations."

their knowledge. Table 1 lists some teaching strategies specific to each multiple intelligence.

The interaction with other students is also observed to be beneficial to the learning process. As Sulim (2012) advocates, "someone's intelligence can lead to the development of someone else's intelligence" (p. 1270). Working cooperatively with other students can also enhance a student's individual intelligence, understanding and knowledge. Instruction using cooperative strategies within groups to optimise learning has become known as Cooperative Learning (Pitler, Hubbel and Kuhn, 2012. p. 73). These authors emphasise the use of well-designed, intentional social interaction to maximise learning. It is through communication and heightened motivation with actively listening peers that students are able to deepen their understanding and interpretation of what is being learnt.

> *"Through communication and heightened motivation with actively listening peers . . . students are able to deepen their understanding and interpretation of what is being learnt."*

Similarly, Arends and Kilcher (2010) maintain that instructional outcomes should enable students to "acquire new information", "develop social skills" and, "develop teamwork skills" (p. 306). It is important to provide students with these life skills that have importance beyond the classroom.

Incorporating cooperative learning and teaching strategies for specific multiple intelligences will create a positive individualised learning environment. The research question of this study asks, "Is student learning enhanced (enjoyed and encouraged) equally when working cooperatively in a group with the same/similar MI or mixed MI group?" This study aimed to explore this question, through the creation of a quality learning environment where students were specifically assigned according to their multiple intelligence. Our hypothesis was that students who were grouped according to same or similar MI scoring would work together more easily and enjoy their experience more than those in mixed MI groups.

Research approach

This research study took place during a five week practice teaching session in July to August 2013 at a private secondary high school in north Sydney. The research was conducted with two Year 7 technology classes and the main activities it involved are summarised in Table 2.

Data Collection Procedures

The Year 7 students were requested to write a process diary which they completed during class time. Students in 7S were paired with a student of the similar multiple intelligence, but in 7X were paired with students of a different multiple intelligence. This was done to assess student learning when working with students of the same or different multiple intelligence.

For each class, at the end of each lesson, engagement level and lesson understanding was assessed and noted by the teacher (the researcher). The teacher recorded notes over the five week timeframe to describe how students struggled or understood

Table 1: Methods and teaching strategies of multiple intelligences (Sulim, 2012, p. 1271)

intelligence	strategies
linguistic	• storytelling, brainstorming, tape recording • daily writing, publishing
logical-mathematical	• calculations and qualifications • classifications and categorisations • socratic questioning, heuristics, science thinking
bodily/kinaesthetic	• body answers, the classroom theatre, hands on thinking • body maps
musical/rhythmic	• recitations, singing, melody, selected audio programs • notions of melodies, mixture of melody
interpersonal	• peer sharing, cooperative groups, simulations
intrapersonal	• one-minute reflection, personal connections, feeling, toned moment • goal setting session
spatial	• visualisation, colour cues, picture metaphors • graphic symbols
naturalist	• collecting data from the real world, employing observation, classification and inference, conducting experiments in the natural environment • exploring the nature, linking courses to the environment

and achieved the given task. The level of engagement was rated on a five point scale, with five representing "highly engaged" and one "limited engagement".

At the end of the study period, students completed a survey related to their learning experience. Questions included the following:

1. Did you enjoy working with your partner? (Scale 1-5, 1 = low, 5 = high enjoyment).
2. What were the strengths of your group?
3. What were the challenges of your group?
4. Did your partner encourage you in your learning? (Scale 1-5, 1= low and 5 = high encouragement).
5. Do you think you would have worked better with another student? Why?
6. Do you think you and your partner learn the same way or differently?
7. Would you like to do further activities in the same group?
8. Overall, please describe your experience working with your partner.

Analysis

Data were collected from student diary notes, group assessments and the survey. The analysis focused upon comparing how students worked in their assigned group (a group of homogenous pairs, or heterogeneous pairs), their learning and understanding of assigned tasks. All responses were recorded in a spreadsheet.

Ratings for questions 1 and 4 allowed comparison of final responses related to enjoyment and encouragement, while qualitative responses to questions 2, 3 and 8 offered opportunity for open ended responses. For questions 5-7, the percentage of "Yes" and "No" responses was calculated and then analysed according to their individual learning and understanding. The teacher additionally analysed the student's personal evaluation of the class assignment at different stages throughout the study period to assess the student level of understanding in comparison to the expected learning outcomes.

"The analysis focused upon comparing how students worked in … homogenous pairs, or heterogeneous pairs, their learning and understanding of assigned tasks."

Table 2: Summary of main activities for the period of the pedagogy study

Time period	main activity
February 2013	• two Year 7 classes were selected to participate in the research project
July/August 2013	• class rolls were colour coded according to each student's multiple intelligence. This summary was designed to provide a continual reference point during the teaching strategy activity
week 1	• each student complete a multiple intelligence test at: *http://www.bgfl.org/bgfl/custom/resources_ftp/client_ks3/ict/multiple_int/* The results from this test were analysed and summarised in a spreadsheet
week 2	• students were informed of their partner (7S – same or similar multiple intelligence set, 7X – different multiple intelligence set) • students were informed of their process diary activity and what was involved. This task was worked on during class time and students were unaware of why they were grouped with their partner. Students were given this time to discuss with their partner how they wanted to present their process diary and began working on it • at this time, the teaching style was adapted according to the students' multiple intelligences. Prior to the class, instructions were written on the board to meet the linguistic, logical and visual learners. Additionally, demonstrations were conducted at the commencement of the class for the kinaesthetic learners • student engagement and understanding levels were noted by the teacher on a spreadsheet
week 3–5	• students were given class time to work on their process diaries and would work with their partner when tasks were required to be done in groups • teaching style was continually adapted to the way that the students learnt best and extra time was put in before class and at the beginning of every lesson to aid in students' understanding
week 5	• in the last lesson, students completed a survey asking them to rate their experiences and explain how they felt during their group work. These responses were collected and analysed through input into a spreadsheet • the assessments (process diary) were collected and evaluated. The task they chose was examined for any relationship to their multiple intelligence. Student learning was evaluated through personal evaluation and student responses

Ethics approval

Ethics approval was granted by the Avondale College of Higher Education School of Education Human Research Ethics Committee. Informed and confirmed consent was obtained from the school and from each participant.

Results

Class 7S had a total of 20 students, and was grouped according to same or similar MI. Class 7X, with 19 students, was not grouped according to MI. At the conclusion of the five week session, four students in Class 7S were absent on the day of the evaluation (9,14,17,20).

The following descriptive summary tabulates for each student (Table 3 and Table 4) their top three intelligences, their lowest intelligence, the assigned grouping for each student and their selected assignment task.

The students were also asked to rate two questions in the survey: Question 1, "Did you enjoy working with your partner"? and Question 4, "Did your partner encourage you in your learning"? These individual ratings are represented in the following figures (Class 7S, Figure 1 and Class 7X, Figure 2).

Within Class 7S (same MI, Figure 1), a significant difference was found between group experience and encouragement mean scores (M_{exp} = 3.87, M_{enc} = 3.20, p = <0.001). Within Class 7X (different MI, Figure 2), no significant different was found between group experience and encouragement (M_{exp} = 2.53, M_{enc} = 2.16, p = 0.07). For combined classes, the group experience and encouragement ratings were significantly different and higher for experience than encouragement (M_{exp} = 3.12, M_{enc} 2.62, p = <0.001).

Comparing the two classes, t-tests indicated a statistically significant difference for group experience (p = 0.003) and encouragement (p = 0.017) means.

> *Comparing the two classes, t-tests indicated a statistically significance difference for group experience (p = 0.003) and encouragement (p = 0.017).*

Table 3: Student multiple intelligence, grouping and selected task for Class 7S (grouped same or similar MI set)

students	top three intelligences			lowest intelligence	grouping	chosen task
7.S.1	interpersonal	visual	kinaesthetic	intrapersonal	7.S.5	video
7.S.2	kinaesthetic	visual	musical	linguistic	7.S.17	video
7.S.3	interpersonal	kinaesthetic	intrapersonal	visual	7.S.20	*PowerPoint*
7.S.4	logical	interpersonal	naturalistic	visual	7.S.18	*PowerPoint*
7.S.5	interpersonal	naturalistic	Linguistic	intrapersonal	7.S.1	video
7.S.6	logical	intrapersonal	interpersonal	linguistic	7.S.7	website
7.S.7	logical	visual	intrapersonal	musical	7.S.6	website
7.S.8	interpersonal	musical	visual	linguistic	7.S.11	video
7.S.9	naturalistic	intrapersonal	musical	linguistic	7.S.10	video
7.S.10	naturalistic	visual	interpersonal	linguistic	7.S.9	video
7.S.11	visual	musical	logical	linguistic	7.S.8	video
7.S.12	musical	interpersonal	intrapersonal	linguistic	7.S.19	video/podcast
7.S.13	interpersonal	Linguistic	naturalistic	logical	7.S.14	website
7.S.14	interpersonal	naturalistic	-	-	7.S.13	website
7.S.15	interpersonal	kinaesthetic	-	-	7.S.16	*PowerPoint*
7.S.16	interpersonal	kinaesthetic	musical	logical	7.S.15	*PowerPoint*
7.S.17	kinaesthetic	musical	interpersonal	logical	7.S.2	video
7.S.18	logical	interpersonal	visual	naturalistic	7.S.4	*PowerPoint*
7.S.19	intrapersonal	musical	kinaesthetic	linguistic	7.S.12	video/podcast
7.S.20	intrapersonal	interpersonal	logical	linguistic	7.S.3	*PowerPoint*

Table 4: Student multiple intelligence, grouping and selected task for Class 7X (grouped different MI set)

students	top three intelligences			lowest intelligence	grouping	chosen task
7.X.1	musical	visual	logical	kinaesthetic	7.X.4	*PowerPoint*
7.X.2	interpersonal	musical	linguistic	kinaesthetic	7.X.6	poster
7.X.3	interpersonal	naturalistic	linguistic	visual	7.X.18	*PowerPoint*
7.X.4	interpersonal	musical	visual	logical	7.X.1	-
7.X.5	kinaesthetic	musical	intrapersonal	linguistic	7.X.19	*PowerPoint*
7.X.6	naturalistic	kinaesthetic	-	interpersonal	7.X.2	poster
7.X.7	intrapersonal	kinaesthetic	interpersonal	musical	7.X.16	*PowerPoint*
7.X.8	musical	logical	linguistic	kinaesthetic	7.X.14	*PowerPoint*
7.X.9	naturalistic	interpersonal	-	visual	7.X.17, 7.X.13	*PowerPoint*
7.X.10	kinaesthetic	naturalistic	interpersonal	intrapersonal	7.X.15	*PowerPoint*
7.X.11	interpersonal	kinaesthetic	linguistic	intrapersonal	7.X.12	*PowerPoint*
7.X.12	kinaesthetic	musical	intrapersonal	linguistic	7.X.11	*PowerPoint*
7.X.13	visual	kinaesthetic	naturalistic	intrapersonal	7.X.17, 7.X.9	*PowerPoint*
7.X.14	interpersonal	kinaesthetic	musical	logical	7.X.8	*PowerPoint*
7.X.15	intrapersonal	naturalistic	visual	musical	7.X.10	*PowerPoint*
7.X.16	musical	interpersonal	visual	intrapersonal	7.X.7	*PowerPoint*
7.X.17	visual	linguistic	interpersonal	kinaesthetic	7.X.9, 7.X.13	*PowerPoint*
7.X.18	visual	kinaesthetic	intrapersonal	interpersonal	7.X.3	*PowerPoint*
7.X.19	visual	interpersonal	logical	kinaesthetic	7.X.5	*PowerPoint*

> *"Would you like to do further activities in the same group?; 66% of the students in … [the] same MI set responded "Yes", . . . while in different MI sets only 21% responded "Yes".*

A strong correlation was also found between group experience and encouragement (Class 7S, r = 0.88; Class 7X, r = 0.67; Combined, r = 0.83).

When students were asked, Question 7, *"Would you like to do further activities in the same group?"*; 66% of the students in Class 7S (same or similar MI set) responded "Yes", and 40 % responded "No", while in Class 7X (different MI sets) only 21% (n=4) responded "Yes", and 5.7% (n=1) said "Maybe". This reflects the higher group experience ratings for Class 7S.

When students were asked, Question 6, *"Do you think you and your partner learn the same way or differently?"*; 73.7% (n=14) in Class 7X and 66.7% (n=10) in Class 7S said they learned differently.

Qualitative responses by the students about their experience are summarised in Table 5.

The teacher made the following observations for each of the classes. For Class 7S (same or similar MI set), students commenced their process diary straight away when tasks were explained. Decisions seemed to be made easily. They always completed the assigned task work by the end of the lesson and never complained about their working group. They seemed positive and did not show any signs of having difficulty with the tasks.

For Class 7X (different MI), students seemed to struggle to commence work with their assigned partner. The students did not find it easy to make quick decisions and also seemed to struggle to share ideas with each other. There were more periods of silence. More guidance and assistance had to be provided by the teacher to assist the students to commence their work. Once they made a decision they were then able to start their work and then wrote different ideas and opinions in their process diaries.

> *... similar MI groups (7S) report a significantly different, higher sense of encouragement and support in learning.*

The group tasks selected by the students were also compared with Sulim's (2012) summary of methods and teaching strategies (p. 1271) (see Table 6).

Discussion

Multiple intelligences (MI) are an important aspect of a classroom environment as every student has their own way of learning. Grouping students in similar MI groups appears to increase their enjoyment of group experience. Further, as self-reported feelings of encouragement and support in learning was found to be in strong positive association with enjoyment of group interaction (group experience), similar MI groups (7S) report a significantly different, higher sense of encouragement and support in learning. Further, this association was stronger for participants within groups of similar MI.

The qualitative data demonstrated that students assigned to work groups according to their dominant intelligences commenced their work earlier and presented varied outputs. Clearly the qualitative data did support some differences between classes, but were not as conclusive as the quantitative results.

This study involved two Year 7 technology classes, where students have not fully developed their social maturity. Students at this age level sometimes struggle to work with students of the opposite gender or with students they do not usually interact with. This may have had an influence on the students' survey results as many of them said they felt uncomfortable at times.

As shown in the results, Class 7S, which had the same or similar MI assigned groups, expressed having had a more positive group experience as illustrated

Figure 1: Class 7S – ratings by each student of their group experience and encouragement at the conclusion of the 5 week session

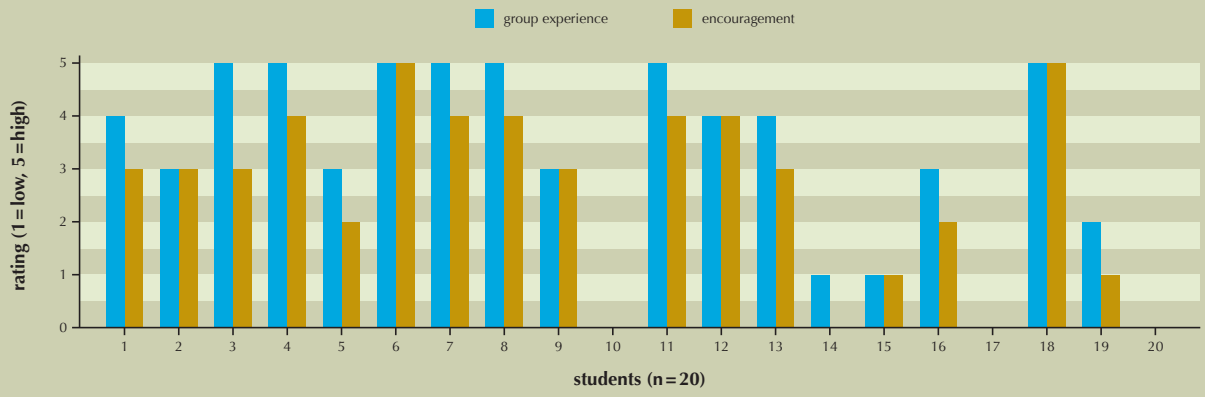

Figure 2: Class 7X – ratings by each student of their group experience and encouragement at the conclusion of the 5 week session

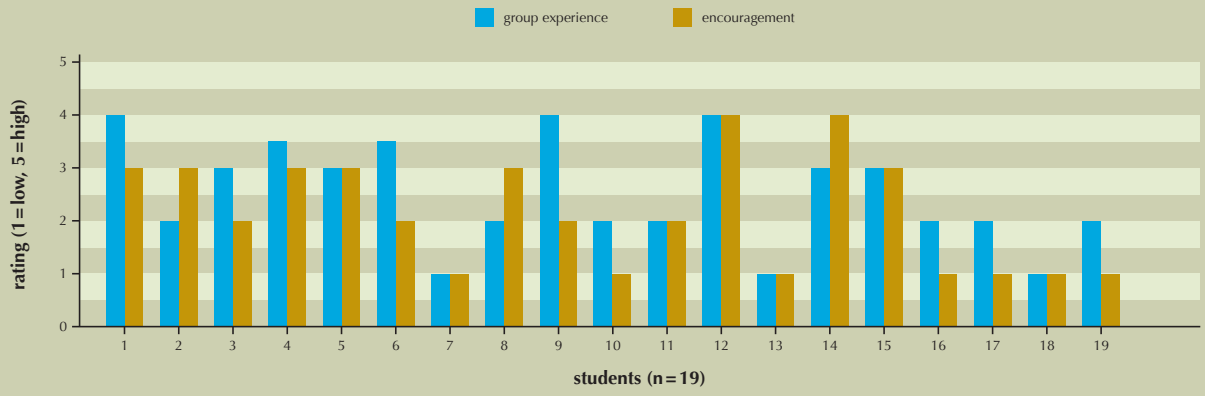

Table 5: Students' comments about the class group task experience

student	comments
	happy with experience
7.S.1	"It was really good because we had no problems. We worked well and we finished on time. I think it would be great to work in these same groups again in this subject."
7.S.11	"It was an ok experience with its challenges and complications but overall we got our work done and got along well."
7.S.12	"[name] and I work well together, would happily work with her again. She got a bit distracted at times but so does everyone. I think it was good to work with her again."
7.S.4	"I think it was a good experience. I feel as though I could've done a lot more but I think it was good and [name] is a really nice person who I enjoy working with."
7.X.12	"I think that we worked well. We learnt well together and we were able to overcome most things."
7.X.13	"It was good because if I didn't understand, [name] might understand it, so that was good." "We got along well."
7.X.3	"I really liked working with [name] because she really understands and is helpful. She is also really good at textiles so sometimes she gives me advice."
	not happy / neutral with experience
7.S.6	"Interesting to work with someone I don't know well. Not that he was unpleasant to work with but maybe I would have found it easier to pick my partner and the teacher decides if that is sensible."
7.S.7	"When working without [separately] it is easier, but when working together it is awkward and we don't work well with each other."
7.S.4	"It was alright but I would of preferred working with someone else because we would have worked better with friends."
7.X.15	"I think it was hard but she didn't disagree on things which made it a bit easier."
7.X.1	"I feel I did all the work and she did little. She sat back while I worked for us both."

"The students … grouped … with different multiple intelligences, were slower to establish a working relationship, but … they are able to discuss ideas and complete the assigned task."

by this comment: "It was really good because we had no problems. We worked well and we finished on time". Students in Class 7S completed process diaries in a variety of ways and demonstrated more levels of creativity. The students' comments were positive about their group experience and expressed that they would be happy to work with the same partner again. They felt that they encouraged each other in their learning experiences. The challenges they experienced were due to individuals feeling they were doing all of the work. Students felt they were able to make decisions easily and demonstrated enthusiasm for group work. As the five weeks drew to a close, the Class 7S were more comfortable about working with their pairs and improved their level of understanding of what was expected.

In contrast, students in Class 7X, which had been assigned to groups with different multiple intelligence, were observed to have a significantly different experience: "I would have found it easier to pick my partner". Most students in this class were observed to struggle to commence the assignment task with their partners. They felt uncomfortable and awkward because they were not working with their friends and many pairs were with students of the opposite sex. There was not as much variety in their presentation. All pairs except for one, selected to present their diary as a PowerPoint. This was observed to be because the students did not make decisions quickly and ended up selecting use of a PowerPoint, an option they were both familiar with. They were still able to complete the task and share thoughts and opinions.

Overall, this study demonstrated that grouping students according to their multiple intelligences provided them with a positive learning environment where they were able to complete their tasks efficiently. The students that were grouped with others with different multiple intelligences, were slower to establish a working relationship, but once they did begin work they are able to discuss ideas and complete the assigned task.

The study experience demonstrated the value of understanding the learning styles of the students. As Hoerr (2002) stated, "believing in and using MI means that educators must be aware of students' strengths and weaknesses in the various intelligences; in short

Table 6: Methods and teaching strategies of Multiple Intelligence according to Sulim (2012) and class selection of activity according to dominant Multiple Intelligence

intelligence	strategies	class 7X	class 7S
linguistic	• storytelling, brainstorming, tape recording • daily writing, publishing	nil	nil
logical-mathematical	• calculations and qualifications • classifications and categorisations • socratic questioning, heuristics, science thinking		*PowerPoint* website
bodily/kinaesthetic	• body answers, the classroom theatre, hands on thinking • body maps	*PowerPoint*	video
musical/rhythmic	• recitations, singing, melody, selected audio programs • notions of melodies, mixture of melody		
interpersonal	• peer sharing, cooperative groups, simulations		video
intrapersonal	• one-minute reflection, personal connections, feeling, toned moment • goal setting session		video/ podcast
spatial	• visualisation, colour cues, picture metaphors • graphic symbols	nil	nil
naturalist	• collecting data from the real world, employing observation, classification and inference, conducting experiments in the natural environment • exploring the nature, linking courses to the environment	poster	video

educators must know their students" (p. 18). In this instance, this was achieved through knowing the students multiple intelligences, strengths and weaknesses, and adapting the teaching style accordingly. At the beginning of every lesson, extra time was taken to present information on the board and in multiple ways with demonstrations. All instructions were presented in multiple ways to meet the range of multiple intelligences of the students. An outcome of this approach was that the students did not re-ask the teacher during the lesson what they were meant to be doing. Although extra time was required at the beginning of every lesson, this time was beneficial, as students would then begin tasks more quickly. It is important that teaching is adapted to create a positive learning environment where students are able to reach their full learning potential.

Chang and Haci (2012) sharing the hypothesis of this study, found, contrary to their expectations that students in mixed MI Chemistry groups reported enhanced learning, a finding similar to science class outcomes reported by Ra'ed & Jadiry (2012). These conflicting results indicate additional research is needed to confirm MI grouping effects.

A limitation of this study was that the research was originally designed for a food technology class, but due to timetabling restrictions the research was conducted with the Year 7 textiles technology classes. The difference is that the food technology students would have been required to work in pairs every double period while cooking, whereas for the textiles class, the students were only required to work with their partners when participating in group activities, thus limiting the amount of time students had to work in their pairs. However, the study did show the benefit of assigning students according to their MI in the textiles classes.

Further, if this study had been conducted in a single gender classroom, the social interface may have been more cohesive and different results may be achieved. Conducting this study over an extended period of time would provide the students with more time to complete their tasks and get to know their partner. An extended period of time would provide more accurate results and allow clearer observation of the changing dynamics in the classroom. Repeating the study with a greater sample size may generate more clarity about classes assigned specific MI sets and about the relationship between group experience and encouragement.

Conclusion

This exploratory study demonstrated that adapting teaching styles and knowing students' MI resulted in students making positive working partnerships particularly in the same or similar MI set, which showed a higher mean group experience. When teaching strategies were designed specific to MI and cooperative learning was integrated into the classroom, it made for an effective group experience and learning environment. Students had the ability to enhance each other's learning intelligence while enhancing their own learning through working together to solve a problem. The relevance of the teacher's role to utilise a variety of learning activities and styles to promote learning among students should be encouraged. TEACH

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