TEACHING INFORMATION LITERACY THROUGH MULTIPLE INTELLIGENCES AND MEDIATED LEARNING: A QUASI EXPERIMENTAL STUDY

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Abstract
Although it is widely believed that information literacy (IL) skills are useful in helping students perform better, academically or otherwise, limited empirical evidence is available showing the relationship between IL skills and IL education. A quasi-experimental pretest-posttest control group study was carried out to investigate the impact of IL teaching approaches, which are grounded in pedagogy, on students’ level and applicability of IL skills. The study was carried out with a cluster of 13- to 15-year-old students from four schools in Singapore. The 476 students who participated in the study were given a pre-intervention test in the beginning. Out of this, 279 students (from two schools) were put through the mediated learning intervention programme (with experimental and control sub-clusters), while the remaining 197 students (from the remaining two schools) were put through the multiple intelligence intervention programme (with experimental and control sub-clusters). A post-intervention test was administered to all students at the end of the intervention programmes. From the results of the pre- and post-intervention tests, it was found that the application of mediated learning (or close coaching) helps students perform better in the learning and application of IL skills, whilst the application of multiple intelligences in helping students learn, facilitated better student learning.

Key words: Information literacy, Multiple intelligence, Mediated learning, Coaching, Pedagogy
1. **Introduction**

The proliferation of information and communication technologies (ICTs), the Internet and the deluge of information that has been infusing through societies and cultures, have brought about a shift in the global education system. It has transformed from being teacher-centred to student-centred. If students are to develop critical and analytical thinking skills that are necessary in this information-rich age, they need teachers who are willing to revolutionise their teaching to take on a more resource-based approach that emphasises information problem-solving (Hughes, 1998). In other words, students must learn how to learn, and in turn, teachers must be able to help them discover how to learn. This is a fundamental characteristic of being information literate (Carr, 1998).

2. **Problem Statement**

To date, there is limited empirical evidence is available showing the relationship between IL skills and IL education. While much research has been done worldwide that have proved IL to be a much-needed skill by students, little research has been conducted on IL teaching approaches (Gibson, 2002; Moore, 2001) or what is termed IL pedagogy. Existing studies on IL have mainly focused only on students’ information skills per se, on library skills or on ICT education. None of these studies has assessed the different approaches to IL education. This study aims to pioneer research on the impact of IL teaching approaches, which are grounded in pedagogy, on students’ level and applicability of IL skills.

In this study, this was carried out by first testing students’ level of IL skills. Students were then assigned into groups of five and given an information-based task. Thereafter, students were given IL training through lectures and hands-on sessions. Students were then divided into sub-clusters, where within each sub-cluster specific IL
teaching approaches were tested on the students. Subsequently, students were made to take the post-intervention test, so as to compare their IL skills before and after the intervention.

The rest of paper is organised as follows: The literature review section examines definitions of information literacy, the relationship of information literacy with pedagogy, and the various types of learning theories and learning styles in pedagogy. The methodology section provides detail of the study that was carried out. The section on data collection and analysis presents the findings of the study, whilst the discussion section explains the significant findings of this study. The section on implications provides some recommendations that would be useful in IL pedagogy, IL policy and IL research. The next section on limitations explains several inherent weaknesses of this study, followed by the final section on conclusion.

3. Literature Review

3.1 Information Literacy

Many definitions of information literacy (IL) have emerged since its inaugural usage in a 1974 government report that was collated by Paul Zurkowski (Kapitzke, 2003). Many authors have described IL as requisites to lifelong learning (Candy, 2002; Gee, Hull & Lankshear, 1996; Moore, 2002). Others have described it as a natural extension of the concept of literacy in our society (Bruce, 2002; Stern, 2002). Some have acquainted IL with information technology (Mitchell, 1996; Mobley, 1996), while others have used it interchangeably with library skills (Kuhlthau, 1990). However, one of the most widely accepted and cited definition (Behrens, 1994) is that given by the American Library Association (ALA) in its landmark report in 1989. It essentially states that an information literate individual is one who recognizes the need for information, is able to effectively
access, evaluate, and creatively use information, and is also an independent learner who demonstrates proactive social responsibility (ALA, 1989).

### 3.2 Information Literacy and Pedagogy

Teaching IL to students does not merely involve library or bibliographic instruction or the ability to use different information sources effectively. It also includes teaching critical and analytical thinking skills regarding the use of information (Kasowitz-Scheer & Pasqualoni, 2002), as well as the ability to generate new ideas from current information and prior knowledge. Numerous and diverse initiatives and strategies to teach IL have been implemented in schools in the US, Australia, New Zealand, South Africa, the UK and throughout Europe (Moore, 2002; Rader, 2002; Virkus, 2003).

Numerous schools around the world have been outfitted with current ICT infrastructures that would enable their students to develop learning opportunities by exploiting these modern tools (Bruce, 2002). However, furnishing schools with modern and advanced technological amenities does not necessarily equate to the students and teachers being competent enough to effectively utilise those tools as information literate individuals. Both students and teachers would only be able to fully benefit from their learning when IL instruction that is grounded in sound and effective pedagogy is seamlessly intertwined with the use of ICTs.

### 3.3 Pedagogy, Learning Theories and Learning Styles

In pedagogy, educational theorists have developed learning theories that can be broadly categorized into four orientations: behaviourist, cognitive, humanistic, and social/situational (after Merriam & Caffarella, 1991 as cited in Smith, 1999). In general,
the majority of these learning theories have often viewed learning as a process rather than a product.

Briefly, the behaviourist orientation views learning as a process where stimuli in the external environment cause a change in the behaviour of the learner in a desired direction. The cognitive orientation focuses on the learner’s internal mental processes of knowing, whilst the humanistic orientation is concerned with the affective part or feelings of the learner. The latter orientation also looks at the development of the learner as a whole - the complete intrapersonal growth and not just the cognition - whereas the social/situational orientation involves the development of the learner in the context of a society or the learner’s interpersonal interactions and eventually personal growth.

Knowledge of the various learning theories is important in understanding how the teaching of IL skills can be carried out. However, it is equally important and beneficial to be aware of the various learning styles of students, in order to know the different preferences that students have when it comes to learning.

Learning styles can be broadly categorized into three groups: information processing-based, personality-based, and multi-dimensional and instructional preferences-based (Yeap, Myint, Lim & Low, 2005).

The information processing-based learning style generally assesses individual cognitive approaches to understanding and integrating information. Learning styles under this category are more likely to make distinctions among the ways that individuals sense, perceive, solve problems, organize, and remember information.

On the other hand, the personality-based learning style examines the influence of individual personality on preferred ways of acquiring and organizing information. Learning styles under this category tend to gauge the ways in which individuals react to
different learning situations. Finally, the multi-dimensional and instructional preferences-based learning style looks at individuals’ preferred environment for learning.

### 3.4 Feuerstein’s Theory of Mediated Learning Experience

Reuven Feuerstein, who is a renowned cognitivist theorist, developed his Theory of Mediated Learning Experience (MLE), which suggests that intelligence, is dynamic and can be modified. To be specific, Feuerstein’s theory does not exclusively belong to the cognitive orientation. His model of stimulus-human intervention-organism-human intervention-response (S-H-O-H-R) is an extension of Piaget’s model of stimulus-organism-response (S-O-R) (cognitivist), which simultaneously incorporates Skinner’s operant conditioning (behaviourist), and Vygotsky’s instructional scaffolding that is grounded in his theory of Zone of Proximal Development (social/situational).

Feuerstein postulates that intelligence is dynamic and variable; that it is not static or fixed from birth; and that intelligence can be modified if given the right stimulation and environment, through a mediator (Feuerstein, 1980). Although Feuerstein’s theory of MLE is not easy to carry out as it involves a deeper level of commitment and effort on the part of the teacher-mediator, it promotes cognitive development in the learner that is evident and lasting (Ben-Hur, 1998). Studies have also shown that students who undergo the MLE programme show significant improvement in mathematics and reading (Greenberg, 1992).

It is thus pedagogically sound to apply Feuerstein’s MLE in helping to entrench students’ learning, as the MLE straddles three orientations of learning theories. This implies that a multi-faceted approach can be carried out simultaneously in helping students learn.
3.5 Gardner’s Theory of Multiple Intelligences

One of the more influential modern thinkers in pedagogy and learning styles is Howard Earl Gardner (1943-current), whose publication “Frames of Mind: Theory of Multiple Intelligences” in 1983 revolutionized teaching and learning in many schools across different cultures and societies. Although it did not evoke much interest amongst the psychology research community, it managed to conceive a new view of learning amongst educators and practitioners (Gardner, 1993). His theory compelled educational researchers, educators, and practitioners to experiment with new ways of imparting information to learners.

Gardner (1983) proposed that each individual possesses, to varying degrees, seven primary forms of intelligences, namely (1) verbal-linguistic, (2) logical-mathematical, (3) bodily-kinaesthetic, (4) visual-spatial, (5) musical, (6) intrapersonal, and (7) interpersonal. He subsequently added an eighth intelligence ‘naturalist’, which involves abilities concerning the natural world, such as plants and animals. The main idea behind Gardner’s theory is that intelligence is not made up of a single universal entity, and instead takes on a plural form. Every individual possesses every single one of the intelligences proposed but to different extents. An individual is expected to be more receptive to learning if his dominant intelligence is exploited and used as a catalyst to encourage learning that is more effective.

It has been found that when a teacher tailors lessons according to students’ needs and preferences, it optimises learning, and that the positive outcomes of catering to the multiple intelligences are active learners and successful students (Nolen, 2003). Studies have also shown that there have been improvement in post-test scores compared to pre-test scores when teachers modified their lessons to address the various types of intelligences of
the students in their class (Weiler, 2005). Thus, the theory of multiple intelligences (MI) is a proven effective tool in education.

4. Methodology

This study aims to determine whether specific IL teaching approaches would make a difference to how well students learn and apply IL skills. In the Singapore school curriculum, education has shifted to a more project-based learning. As such, students are required to possess substantial research skills in order to carry out their project work well. This in turn, has taken a toll on teachers’ expertise and workload as they are now expected to impart not just domain knowledge to students, but information literacy skills as well. In addition, the majority of Singapore schools do not have qualified school librarians who are able to impart the necessary IL skills to students (Mokhtar & Majid, 2006). Thus, to augment students’ project-based learning and lend support to teachers’ lessons, this study was carried out to determine how IL trainers and school librarians can facilitate student learning in the area of IL through pedagogically-based IL teaching approaches. With this in mind, a quasi-experimental pretest-posttest control group study was conducted with a group of 479 students aged between 13 and 15-years old, from four schools in Singapore.

Out of more than twenty schools that were approached to participate in the study, four schools responded favourably. Two schools were randomly selected to participate in the mediated learning intervention programme cluster (279 students), whilst the remaining two schools were put on the multiple intelligence intervention programme cluster (197 students). Figure 1 summarises diagrammatically the methodology used in this study.

Before any intervention was carried out, the students in both clusters were asked to take the pre-intervention test. The test consists of 32 elements that address mainly two
components – (i) search techniques and strategies; and (ii) information use and misuse. Each element had a right or wrong answer, giving a total score of 32 marks for the test.

Thereafter, each cluster was given IL training that lasted 5 weeks. The IL training comprised lectures, hands-on sessions and group activities for students to help them learn basic IL skills. Each cluster of students was then divided into smaller groups of five students each. The cluster that underwent the mediated learning intervention programme was given the topic of Recycling, whilst the cluster that underwent the multiple intelligence intervention programme was given the topic of Ethics and Society. Each group was given an information-based task, based on their respective topics, and supposed to look up information for the task as a group. Ultimately, they were supposed to present what they have found out for their task to the class.

The cluster that underwent the mediated learning intervention programme was later randomly dichotomised into experimental and control sub-clusters. The experimental sub-cluster was then closely coached and guided on how to apply the IL competencies that they learnt into doing their project, at a duration of one hour per week for six weeks with the researcher. The other sub-cluster (control) was left very much on their own with minimal supervision. After six weeks, the students were asked present what they have found out for their task to the class.

The other cluster underwent the multiple intelligences intervention programme. This cluster was divided into three sub-clusters: (1) random grouping, (2) heterogeneous grouping, and (3) homogeneous grouping. The random grouping sub-cluster means that students were grouped randomly. The heterogeneous sub-cluster means that students were grouped based on a mix of individual dominant intelligence (based on Gardner’s MI), whilst the homogeneous sub-cluster means that students were grouped based on a uniformity of individual dominant intelligence. As before, each group comprised five
students. Students in each sub-cluster were monitored on their group interactions by the researcher at a duration of one hour per week over six weeks. However, students in the heterogeneous or homogeneous sub-clusters were encouraged to explore and utilise their individual intelligence when doing their task, whilst students in the random sub-cluster were left very much on their own with minimal supervision. After six weeks, the students were asked to present what they have found out for their task to the class as a group.

At the end of the 11 weeks, students in both clusters were asked to take the post-intervention test. The pre- and post-intervention tests were comparable in terms of scope and difficulty. The purpose of the post-intervention test was to determine the impact of the different IL teaching approaches on their understanding and applicability of IL skills, and to compare their skills before and after the intervention.
Figure 1: Methodology employed

Pre-intervention test

Basic Information Literacy training (5 weeks)

Assignment of task

Mediated learning cluster, N=279

Control sub-cluster, n=119

No further training or intervention; minimal guidance and supervision (6 weeks)

Presentation of information obtained for task to the class

Post-intervention test

Experimental sub-cluster, n=160

Close monitoring and personalised group coaching (6 weeks)

Presentation of information obtained for task to the class

Post-intervention test

Multiple intelligences cluster, N=197

Random sub-cluster, n=36

Minimal guidance and supervision (6 weeks)

Presentation of information obtained for task to the class

Post-intervention test

Heterogeneous sub-cluster, n=80

Encouragement to explore and utilise individual dominant intelligence (6 weeks)

Presentation of information obtained for task to the class

Post-intervention test

Homogeneous sub-cluster, n=81

Encouragement to explore and utilise individual dominant intelligence (6 weeks)

Presentation of information obtained for task to the class

Post-intervention test
5. Data Collection and Analysis

5.1 Demographics

Altogether there were 476 students who participated in the study – 279 students were in the mediated learning cluster, and 197 students were in the multiple intelligences intervention cluster. The following (Table 1) gives the breakdown of the students who belonged to the mediated learning intervention cluster – comprising the experimental sub-cluster or control sub-cluster.

<table>
<thead>
<tr>
<th>Table 1: Mediated learning intervention cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
</tr>
<tr>
<td>No coaching (control)</td>
</tr>
<tr>
<td>With coaching (experimental)</td>
</tr>
<tr>
<td>Total possible</td>
</tr>
</tbody>
</table>

The following (Table 2) gives the breakdown of students who belonged to the multiple intelligences intervention cluster – comprising the three sub-clusters of (i) random grouping, (ii) heterogeneous grouping, and (iii) homogeneous grouping.

<table>
<thead>
<tr>
<th>Table 2: Multiple intelligences intervention cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
</tr>
<tr>
<td>Random grouping</td>
</tr>
<tr>
<td>Heterogeneous grouping</td>
</tr>
<tr>
<td>Homogeneous grouping</td>
</tr>
<tr>
<td>Total possible</td>
</tr>
</tbody>
</table>

For the pre- and post-intervention tests by the mediated learning intervention cluster, there was a substantial response rate of 214 (76.7%) and 246 (88.2%) respectively (Table 3). Only students who completed both the pre- and post-intervention tests were included in the data analysis.

<table>
<thead>
<tr>
<th>Table 3: Response rates for mediated learning intervention cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
</tr>
<tr>
<td>Pre- test</td>
</tr>
<tr>
<td>Post- test</td>
</tr>
<tr>
<td>Valid cases for pre- and post- tests</td>
</tr>
</tbody>
</table>
For the pre- and post-intervention tests by the multiple intelligences intervention cluster, there was a substantial response rate of 167 (84.8%) and 174 (88.3%) respectively (Table 4). Only students who completed both the pre- and post-intervention tests were included in the data analysis.

Table 4: Response rates for multiple intelligences intervention cluster

<table>
<thead>
<tr>
<th></th>
<th>No. of students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>167</td>
<td>84.8</td>
</tr>
<tr>
<td>Post-test</td>
<td>174</td>
<td>88.3</td>
</tr>
<tr>
<td><strong>Valid cases for pre- and post-tests</strong></td>
<td><strong>147</strong></td>
<td><strong>74.6</strong></td>
</tr>
</tbody>
</table>

5.2 Results

A comparison of the means of the pre- and post-intervention test scores is made between the various sub-clusters of students. For the mediated learning intervention sub-cluster, it is seen that students in the experimental sub-cluster did better for the pre-test (percentage mean = 34.9%). For the post-test, students in the experimental sub-cluster still did better (percentage mean = 39.0%).

However, it was observed that the difference in scores (post – pre) was higher for the experimental sub-cluster (difference = 4.1%) compared to the control sub-cluster (difference = 3.1%) A paired samples t-test was carried out on the data, yielding an overall significance level of 0.054 for the control sub-cluster, and a value of 0.004 for the experimental sub-cluster. This implies that the difference between the pre- and post-intervention test scores is not due to chance variation and is in fact due to the intervention – more so for the experimental sub-cluster.

Table 5: Percentage means for pre- and post-intervention test scores (mediated learning intervention cluster)

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Standard deviation</th>
<th>Post</th>
<th>Standard deviation</th>
<th><em>p</em>-value (paired)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No coaching</td>
<td>30.3</td>
<td>11.81</td>
<td>33.4</td>
<td>12.96</td>
<td>0.054</td>
</tr>
<tr>
<td>With coaching</td>
<td>34.9</td>
<td>13.23</td>
<td>39.0</td>
<td>11.88</td>
<td>0.004</td>
</tr>
</tbody>
</table>
For the multiple intelligences cluster, it is observed that students who were randomly grouped showed the most remarkable improvement in scores (difference = 13.7%). However, it must be noted that this sub-cluster of students performed the worst in the pre-test (percentage mean = 19.3%) compared to the other sub-clusters. Students who were homogeneously grouped showed the next best improvement (difference = 10.2%), followed by students who were heterogeneously grouped (difference = 5.7%). The paired samples t-test p-values show that there are significant differences between the pre- and post-scores, for the various sub-clusters.

Table 5: Percentage means for pre- and post-intervention test scores (multiple intelligences intervention cluster)

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Standard deviation</th>
<th>Post</th>
<th>Standard deviation</th>
<th>p-value (paired)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random grouping</td>
<td>19.3</td>
<td>10.41</td>
<td>33.0</td>
<td>11.44</td>
<td>0.000</td>
</tr>
<tr>
<td>Heterogeneous grouping</td>
<td>32.3</td>
<td>10.62</td>
<td>38.0</td>
<td>10.76</td>
<td>0.002</td>
</tr>
<tr>
<td>Homogeneous grouping</td>
<td>25.9</td>
<td>11.98</td>
<td>36.1</td>
<td>10.23</td>
<td>0.000</td>
</tr>
</tbody>
</table>

6. **Discussion**

For the mediated learning intervention cluster, the differences in pre-post test scores are quite apparent between the experimental sub-cluster and control sub-cluster. This is a significant finding in that IL competencies cannot be sufficiently learnt and applied when the competencies are learnt through a one-time training, be it in the form of lecture-tutorial, workshops or hands-on sessions. The competencies need to be entrenched through close coaching and mediated learning so that students are able to identify their learning gaps, rectify them and improve their learning under the close supervision and guidance of an expert.

Farmer (2006) mentioned that naturally, children ask a lot of questions because they try to understand what goes on around them. He reasoned that asking questions is a
crucial component of information seeking, and that it helps them to learn and change based on what they discover. However, he also claimed that youths may not necessarily know the right questions to ask in order to learn, and that this needs to be taught to them. In addition, the information explosion has created the need for more – and not less – guidance in the evaluation, selection, and use of information (Foo, Chaudhry, Majid, & Logan, 2002). Thus, even with the widespread availability of the Internet, students still need guidance and coaching on how to use the information found online effectively. These are both supported by the findings of the study, where it was found that close coaching and mediated learning makes a difference to how students perform in their IL test.

Hence, the role of a coach or mediator – one who is able to ask the right questions for students to reflect on their learning, and who can then guide the learning process – makes a lot of difference. As Feuerstein (1980) explained, in close coaching or mediated learning, students learn through the intercession of a mediator whose main role is to help them interact more fruitfully with the learning factor, and interpret or even modify their responses in order to increase their understanding. As such, in this case, students were able to entrench the IL competencies that they learnt from the IL training sessions, and were better able to apply these competencies in the test, through the questions posed by the mediator or coach.

For the multiple intelligences intervention cluster, it is obvious that students in the random grouping sub-cluster showed the greatest improvement overall (difference = 13.7) compared to those who were homogeneously grouped (difference = 10.2) or heterogeneously grouped (difference = 5.7). Although it is not quite clear why students who were randomly grouped showed the greatest improvement, one line of argument is that the phenomenon could be due to what is known as the effect of statistical regression, which is a threat to internal validity. To elaborate, this sub-cluster of students (random
grouping) performed the worst for the pre-test, which effectively places them at the extreme lower end scores. With the administration of a post-test, this sub-cluster of students will show a natural regression towards the mean and perform just as well as the others in the post-test. This in turn implies that their post-pre test difference will definitely be higher than the other two sub-clusters. In addition, this sub-cluster of students was made up of only one class of students, which was much smaller in number compared to the other two sub-clusters.

However, a more interesting observation was that students who were homogeneously grouped did better than those who were heterogeneously grouped. Although excessively homogeneous groups have been recognized to have a negative effect on performance (Belbin, 1980, as cited in Moore, 1991), it must also be understood that children, and even adults, learn more from imitation or copying from role models, certain common patterns of behaviour and perceptions (Ridley, 1996, as cited in Pech, 2001). This is also consistent with Vygotsky’s and Bandura’s claims that children learn through observing and interacting with their mentors, and will tend to imitate their behaviours or actions. It is thus reasonable to extend their claims that a certain amount of uniformity in behaviour, or homogeneity, is conducive for learning to take place, and before creativity can even occur.

In addition, it has been shown in prior related studies (Jehn, Northcraft & Neale, 1999; Pelled, Eisenhardt & Xin, 1999) that groups with heterogeneous make-up tend to have high probabilities of task-related or relationship conflicts. Although task-related conflicts have been found to have positive effects on group functions and outcomes (Jehn, 1995), relationship conflicts have been found to be otherwise. To elaborate, heterogeneous groups with frequent or intense relationship conflicts tend to have low group functioning because of increased levels of stress and anxiety that in turn have a negative effect on their
cognitive abilities or potential (Staw, Sandelands & Dutton, 1981). In addition, relationship conflicts can also result in antagonistic interaction among the group members and thus hamper overall group outcomes (Janssen, Van de Vliert & Veenstra, 1999). Thus, it can be adequately explained why students in the homogenously grouped sub-cluster of this study managed to perform better than the heterogeneously grouped sub-cluster.

It must be emphasised that although students who were involved in this study were grouped based on their individual dominant intelligence, a majority of these students exhibit several other intelligences simultaneously. It must also be asserted that such a finding is neither exhaustive nor conclusive enough, and that more research and experimentation must be carried out to confirm or even dispute the finding. It is also not the intent of this study to determine which type of grouping is better; instead, it has been sufficiently proven that the use of learning styles (Gardner’s MI, in this case) has been effective in making students perform better in the application of IL skills.

7. Implications

From the findings of this study, it can be established that the application of learning theories and styles makes a positive difference to students’ learning. It was found that the application of learning theories adequately facilitates students’ learning, and when students’ interests were taken into consideration when imparting IL skills to them, they were more receptive and performed better in the IL skills test. Just as teachers have different teaching styles and preferences (Smith, 2005), students also have their respective learning styles and preferences, which greatly shape the way they learn and how much they retain and are able to apply what they learn. It is thus important to recognise and understand the different approaches to teaching and learning.
In the area of information studies and library science, this bears significant implications for instructional librarians and other IL educators, in particular. Other than being equipped with domain knowledge in the discipline of information studies and library science, instructional librarians must also be equipped with pedagogical competencies (Rockman, 2004), such as learning theories and styles, so that they are more aware of the different ways in which they can impart their knowledge to students or patrons in the library in order to successfully engage them (Jacobson & Xu, 2004).

Secondly, in schools, teachers and librarians can and should collaborate on planning lessons and learning activities (Mokhtar & Majid, 2006). This collaboration can effectively draw upon the expertise of each professional – curriculum experience and pedagogical competencies of the teacher; and domain knowledge and library skills of the librarian. Collaborative planned lessons would encompass a more holistic learning approach for students so that they are able to learn and apply IL skills in their curriculum-based subjects seamlessly. In addition, IL should also be incrementally taught and reinforced to students, from the primary school level, through the secondary school level, and right up to tertiary education level. This will ensure that there is continuity in students’ learning and application of IL skills.

Finally, a more desirable situation would be for schools to have teacher librarians – qualified teachers who are further trained in information studies and library science. These teacher librarians would be able to simultaneously apply their proficiencies in pedagogy and library science in their teaching and integrate IL within the curriculum. Students would truly benefit from this integration. In addition, these teacher librarians can collaborate with or provide assistance to other teachers within the school, especially in weaving IL into various subjects, using the school library in the curriculum, and in selecting and using information sources more effectively. Their grounding in pedagogy
puts them at an advantage over school librarians who may not have had any teacher training.

8. Limitations

First of all, the study was conducted with only about 200 students for each cluster. There was a relatively high attrition rate of 28.0% for the first cluster, and 26.4% for the second cluster, based on the number of students who answered both the pre- and post-intervention tests. One possible reason for this high attrition rate is because the IL training was carried out as an enrichment programme and did not form part of the examinable curriculum for students. As a result, students put in less effort and placed little importance to the programme and in completing the given tasks. Although the results are quite significant and convincing, it would be ideal if the study can be replicated with a larger pool of students, so as to minimize the attrition rate and improve the accuracy of the findings. This is especially important in addressing the anomaly of the results obtained for the randomly grouped students in the multiple intelligences intervention cluster.

Next, although the content of the IL training course that was given to students comprised the necessary competencies, feedback was obtained that the course should be more interactive and interesting, and that more hands-on sessions should be included. With this consideration, it is recommended that the IL training be carried out more frequently with shorter duration, so as to allow more interactive activities and hands-on sessions to be incorporated. It can be assumed that with more interactive and hands-on activities, the attrition rate can also be reduced.

Finally, due to time and manpower constraints, the study was carried out with 13 to 15-year-old students only. It would be good to extend the study to include both older and
younger students. However, this would then require both the IL topics and task requirements to be customised to suit the different levels of student abilities.

9. Conclusion

Appropriate pedagogical approaches on the part of instructional librarians, teacher librarians, and other IL educators, need to be in place so that IL instruction is entrenched and effective. It must also be recognised that IL education is not meant to be transient, and that a long-term, continuous IL teaching approach based on sound pedagogy, will be more utilitarian in ensuring that students are equipped with IL skills and are able to apply these skills in their school work or otherwise.

When instructional librarians, teacher librarians, and other IL educators are able to continuously monitor their students’ progress and application of IL skills, and constantly provide many opportunities for those skills to be utilised, then the actual learning of IL is able to take place. There is no specific pedagogical approach that can be claimed to teach IL most effectively. However, an effort to experiment with the various IL teaching approaches to find one or a combination of a few methods that are best suited to the students that are taught, ought to be made. It is thus recommended that instructional librarians, teacher librarians, and other IL educators be equipped with pedagogical training in addition to their domain knowledge in library and information science, which is, after all, a user-centred and instruction-based discipline.
References


