Visual Spatial Intelligence makes it possible for people to perceive visual or spatial information, to transform this information, and to recreate visual images from memory. Well-developed spatial capacities are needed for the work of architects, sculptors, and engineers. Researchers were very keen to observe to study the effectiveness of toolkit of life skill education programme based toolkit on visual-spatial intelligences among secondary school students. They used experimental method of research. The experiments were conducted in more than 20 secondary schools. Purposive and Convenient sampling technique has been used for drawing the sample. Secondary schools affiliated to SSC board were considered for the study. The project was carried out in English medium and co-education type of schools. It was found that, the mean of gain scores of Visual-spatial intelligence of experimental group is significantly higher than that of control group. Hence it can be inferred that there is a significant difference in the gain scores of Visual-spatial intelligence of experimental and control groups. These findings indicate that the gain scores of experimental and control groups differ significantly. Therefore it was inferred that intervention programme organized has helped to develop Visual-spatial intelligence in the students of standard VIII of the experimental group. It was also inferred that the contribution of intervention of the educational programme (Toolkit) in the development of Visual-spatial intelligence is 14.05%. Thus it can be concluded that the intervention of the educational programme (Toolkit) has helped to enhance Visual-spatial intelligence among VIII standard students.
I. INTRODUCTION

Gardner identifies eight intelligences, all of which he considers “part of our birthright.” However, he adds that “no two people have exactly the same intelligences in the same combination.” The eight intelligences are linguistic, logical, musical, spatial, bodily kinaesthetic, interpersonal, intrapersonal, and naturalistic. The extent to which the various intelligences develop depends, to a significant extent, on the individual’s education and culture.

Gardner argues intelligence is categorized into three primary or overarching categories, those of which are formulated by the abilities. According to Gardner, intelligence is: 1) The ability to create an effective product or offer a service that is valued in a culture, 2) a set of skills that make it possible for a person to solve problems in life, and 3) the potential for finding or creating solutions for problems, which involves gathering new knowledge.

Gardner, Howard (1997) wrote an article, “Multiple Intelligences as a Partner in School Improvement published in Educational leadership.” He added that it is difficult to grasp multiple-intelligences theory and implement its implications effectively. Multiple Intelligent theory is not a quick fix. However, educators who thoughtfully use the theory to support their larger educational goals find it a worthy partner in school improvement. The author has praised the efforts of several researchers and practitioners in this "Educational Leadership" issue and issues a special challenge to each of them.

Visual Spatial Intelligence makes it possible for people to perceive visual or spatial information, to transform this information, and to recreate visual images from memory. Well-developed spatial capacities are needed for the work of architects, sculptors, and engineers. The students who turn first to the graphs, charts, and pictures in their textbook, who like to “web” their ideas before writing a paper, and who fill the blank space around their notes with intricate patterns are also using their spatial intelligence. While usually tied to the visual modality, spatial intelligence can also be exercised to a high level by individuals who are visually impaired.

Christison, Mary Ann (1996) wrote an article that encourages using the seven intelligences--verbal, musical, logical, spatial, kinaesthetic, interpersonal, and intrapersonal--in problem situations and focusing on the varied approach to learning fostered by these intelligences. His article also discusses a language classroom that helps develop a vision for expanding intelligent behavior and reinventing language learning.

Silver, Harvey; Strong, Richard; Perini, Matthew (1997) inferred that Multiple-intelligences theory (MI) explores how cultures and disciplines shape human potential. Both MI and learning-style theories reject dominant ideologies of intelligence. Whereas learning styles are concerned with differences in the learning process, MI centres on learning content and
products. Blending learning styles and MI theories via integrated intelligence menus may help minimize each theory's limitations and enhance its strengths.

Greenhawk, Jan (1997), hired Specialists to help teachers develop standards for grading students' art work and oral presentations and to prepare students for state assessments, written descriptions often accompany students' chosen methods for displaying knowledge. It was observed in their research endeavour that in the five years since a Trappe, Maryland elementary school put Gardner's multiple-intelligences theory into practice; students' overall achievement and confidence have risen substantially.

Toni Nobel (2004) combined the typologies of Multiple Intelligence theory and Revised Bloom's Taxonomy. He observed that teachers gained an integrated model of the different ways that students learn in different intellectual domains and different thinking capabilities. Students’ greater understanding of their own and others’ learning and their motivation for learning during MI/RBT learning centre time illustrated ways their learning can be made more meaningful.

R. Poornima, G.Lokanadha Reddy, (2011) focused on the Theory of Multiple Intelligence and its educational implications. This article explored the theory of MI (nature, criteria for recognition, key points of the theory and eight intelligences), describes the general teaching strategies practiced, barriers in implementing the MI in the classroom and ways and means to overcome those barriers.

Mesut Tabuk,, Ahmet Şükrü Özdemir (2009) advocated the use of certain alternative teaching methods, including project based leaning and multiple intelligence approach. The emphasis throughout is on getting students to participate more, to interact more, and to broaden their perspective. The purpose of this research is to determine the effects of multiple intelligence approach in project based learning on the students’ mathematics achievements.

Abdallah, Mahmoud Mohammad Sayed (2008) shaded some light on the history of MI Theory and the traditional IQ tests to clarify the rationale underlying this new theory. Then, it illustrates the initial seven intelligences that Gardener suggested (i.e. Verbal-linguistic intelligence, logical-mathematical intelligence, bodily-kinaesthetic intelligence, spatial intelligence, interpersonal intelligence, intrapersonal-reflective intelligence and musical intelligence). It goes on to highlight the educational applications and implications of MI Theory in English Language Teaching, with special focus on what has come to be called MI-Based Instruction.

Williams, R. Bruce, (2007) focused on Multiple Intelligences for differentiated learning. There is an intricate literacy to Gardner's multiple intelligences theory that unlocks key entry points for differentiated learning. Using a well-articulated framework, rich with graphic representations, Williams provided a comprehensive discussion of multiple intelligences. He moved the teacher and students from curiosity to confidence and to
competence in understanding and using the multiple intelligences theory in the most practical ways in curriculum, instruction and assessment.

Micheal M, (2005), carried out a study to explore the assessment practice in “A level secondary schools with the major focus on Continuous Assessment Strategies. The findings of the study revealed that: Numerous Continuous Assessment Strategies (i.e. the written tests, recap exercises, take-home assignments, check lists, observation, presentations and projects) were being used in A level secondary schools. A positive relationship was observed between some of the continuous assessment strategies used and students’ performance.

Based on the above review of related literature, the researchers found that none of the above researchers have made an attempt for development of multiple intelligences, hence were keen to undertake an experimental study to measure the effect of life skill education programme on Visual-spatial intelligence of secondary school students. Amstrong Thomas (1999) in his book have defined Visual Spatial Intelligence that involves thinking in pictures and images and the ability to perceive, transform, and recreate different aspects of the visual-spatial world. As such it is the playground of architects, photographers, artists, pilots, and mechanical engineers. Whoever designed the Pyramids in Egypt had a lot of this intelligence. So too did individuals like Thomas Edison, Pablo Picasso, and Ansel Adams. Highly spatial individuals often have an acute sensitivity to visual details and can visualize vividly, draw or sketch their ideas graphically, and orient themselves in three-dimensional space with ease. Lazear, D. G. (1994) in his book, “pathway of learning, teaching students and parent about multiple intelligences” a process of knowing that occurs through seeing both externally (with the physical eyes) and internally (with the mind’s eye). It uses such tools as drawing, painting sculpture, collage, montage, visualization, imagination, pretending, and creating mental images. Bruce Campbell (2008) in his book, “Handbook of Differentiated Instruction Using the Multiple Intelligences Lesson Plans & More” describes visual spatial intelligence as the ability to think in three dimensions. Core capacities of this intelligence include mental imagery, spatial reasoning, image manipulation, graphic and artistic skills, and an active imagination. Sailors, pilots, sculptors, painters, and architects all exhibit spatial intelligence. Researchers also were very keen to observe to study the effect of effectiveness of co scholastic based toolkit on visual-spatial intelligences among secondary school students. The aim, objectives and research design of the study employed for the same is described as under:

1.1 Aim of the study
To study the effectiveness of toolkit of life skill education programme on Visual-spatial intelligence of secondary school students.

1.2 Objectives of the study
i.) To study the effectiveness of toolkit of life skill education programme on Visual-spatial intelligence of secondary school students.

ii.) To compare the pre and post test scores of Visual-spatial intelligence for experimental and control groups.
iii.) To compare the gain scores of Visual-spatial intelligence test for experimental and control groups.

iv.) To measure the proportion of variance in gain scores of Visual-spatial intelligence Due to intervention of the educational programme (Toolkit)

1.3 Hypothesis of the study
There is no significant difference in pre and post test scores of Visual-spatial intelligence for experimental and control groups.

II. RESEARCH DESIGN
For the present study, the researchers have used the experimental research approach. The present study focuses on establishing the cause-effect relationship between the independent variable and the dependant variable. The cause, independent variable is ‘Toolkit’ and the dependant variable is the Visual-spatial intelligence. Therefore the researcher used the Quasi-Experimental Pretest - posttest Non-equivalent group design.

i.) Sampling: For the present experimental study, the eight standard students has been selected and considered for the study. The sample of study has been 1200 students studying in secondary schools of South and Central Mumbai.

ii.) Sampling Technique: Purposive and Convenient sampling technique has been used for drawing the sample. Secondary schools affiliated to SSC board have been considered for the study. The project was implemented in English medium and co-education type schools only.

iii.) Treatment: The comprehensive developed toolkit has been designed that comprises teaching and learning activities to extend Gardner’s theory to effective classroom practice. The newly developed toolkit comprises 15 comprehensive student centric educational activities based on the implications of multiple-intelligence theory that has stimulated student teachers to find more ways of helping all students in their classes. The specially designed workshops has been organised by student teachers in secondary schools of South and Central Mumbai.

iv.) Tools of the Study: The tool has been constructed to measure Visual-spatial intelligence of experimental and control groups before and after the treatment. The data has been collected from eight standard secondary school students of 20 schools. The researchers have constructed and standardised tool to measure the Visual-spatial intelligence of VIII standard students with the help of experts and has established the validity and reliability of the tool.

v.) Data Collection: Data has been collected from the experimental and control groups. The data was collected in two phases one in the beginning of the study as pretest scores and two at the end of the treatment as posttest scores.

III. ANALYSIS OF DATA
Analysis is critical for the process of research. Analysis is a form of description of data gathered in a systematic and scientific way. Statistical analysis acts as a quantitative link for the communication of result. The data collected has been scored and compiled to
appropriate statistical tests to test the hypotheses formulated. The data has been analyzed using descriptive and inferential statistics.

- **Descriptive analyses:** Describes what applies to the data and helps the researchers have drawn conclusions and have generalized to sample of the population. Mean scores of the each were calculated and were compiled for the purpose of the further data analysis.

- **Inferential Analysis:** Research has no meaning unless it draws inferences for the characteristics of the population. Inferential analysis helps to extend the generalization to the entire population from which the sample is drawn. The inferential techniques for testing the hypotheses in the study will be used such as t-tests, two way anova, t- ratio and $\omega^2$ estimate values.

### IV. TESTING OF HYPOTHESIS

**H1: There is no significant difference in pre and post test scores of Visual-spatial intelligence for experimental and control groups.**

a. There is no significant difference in pre and post test scores of Visual-spatial intelligence for experimental group.

**Variables:** Pre and post test scores of Visual-spatial intelligence

**Groups:** Experimental Group

b. There is no significant difference in pre and post test scores of Visual-spatial intelligence for control group.

**Variables:** Pre and post test scores of Visual-spatial intelligence

**Groups:** Control Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Variable</th>
<th>Test</th>
<th>N</th>
<th>df</th>
<th>Mean</th>
<th>SD</th>
<th>t-ratio</th>
<th>Level of significance</th>
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<tbody>
<tr>
<td>Visual Spatial Intelligence</td>
<td>Experimental</td>
<td>Pre-test</td>
<td>20</td>
<td>38</td>
<td>31.21</td>
<td>4.07</td>
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<td>Significant at 0.01 Level</td>
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<td>Post-test</td>
<td></td>
<td></td>
<td>36.55</td>
<td>3.86</td>
<td></td>
<td></td>
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<td></td>
<td>Control</td>
<td>Pre-test</td>
<td>20</td>
<td>38</td>
<td>32.08</td>
<td>2.98</td>
<td>1.53</td>
<td>Not Significant at 0.05 Level</td>
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<tr>
<td></td>
<td></td>
<td>Post-test</td>
<td></td>
<td></td>
<td>33.77</td>
<td>3.94</td>
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<table>
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<th>Mean</th>
<th>S.D</th>
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<th>p values</th>
<th>Level of significance</th>
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<tr>
<td></td>
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<td>20</td>
<td>31.21</td>
<td>4.07</td>
<td>4.26</td>
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<td>36.55</td>
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<tr>
<td></td>
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<td>32.08</td>
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<td>1.53</td>
<td>&gt;0.134</td>
<td>Not Significant at 0.05 Level</td>
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<td>Posttest</td>
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<td>33.77</td>
<td>3.94</td>
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</tbody>
</table>
Dr. (Mrs.) Mintu Sinha, Dr. Bhagwan Balani :: A Study of Effectiveness of Toolkit of Life Skill Education Programme on Visual-Spatial Intelligence of Secondary School Students

EG: $N=20, \text{df} (N-1) =39$, tabulated $t$ values at 0.05 = 2.026 and 0.01 = 2.64
CG: $N= 20, \text{df} (N-1) =39$, tabulated $t$ values at 0.05 = 2.026 and 0.01 = 2.68.

**Findings:**

**Experimental group:** $t$-ratios are significant ($t = 4.26$) and $p < 0.05$, therefore the null hypothesis is rejected.

**Control group:** $t$-ratios are significant ($t = 1.53$) and $p > 0.05$, therefore the null hypothesis is accepted.

**H2: There is no significant difference in the gain scores of Visual-spatial intelligence test for experimental and control groups.**

**Variables:** Gain scores of Visual-spatial intelligence

**Groups:** Experimental and Control Groups

**Table 3:** Calculation of Gain scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups</th>
<th>N</th>
<th>Pre Test Scores</th>
<th>Post Test Scores</th>
<th>Gain scores</th>
<th>Gain score SD</th>
<th>t-ratio</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual-spatial intelligence</td>
<td>Experimental</td>
<td>20</td>
<td>31.21</td>
<td>36.55</td>
<td>5.35</td>
<td>5.10</td>
<td>2.5567</td>
<td>Significant at 0.05</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>20</td>
<td>32.08</td>
<td>33.77</td>
<td>1.69</td>
<td>3.87</td>
<td></td>
<td>Level</td>
</tr>
</tbody>
</table>

**Observations:**

P value and statistical significance:
The two-tailed P value equals 0.0147
By conventional criteria, this difference is considered to be statistically significant.

**Confidence interval:**
The mean of Group One minus Group Two equals 3.6600
95% confidence interval of this difference: From 0.7620 to 6.5580

**Intermediate values used in calculations:**

- $t = 2.5567$
- $df = 38$
- Standard error of difference = 1.432

**Results**

- From the table, it is seen that for gain scores of Visual-spatial intelligence of experimental and control groups the obtained $t$- ratio is significant at 0.05 level.

- The mean of gain scores of Visual-spatial intelligence of experimental group is significantly higher than that of control group.

- Hence it can be inferred that there is a significant difference in the gain scores of Visual-spatial intelligence of experimental and control groups.
Interpretation

These findings indicate that the gain scores of experimental and control groups differ significantly. It can thus be inferred that intervention programme organized has helped to develop Visual-spatial intelligence in the students of standard VIII of the experimental group.

$\omega^2$ – estimate

- Since t-ratios of gain scores for Visual-spatial intelligence are not found to be significant hence $\omega^2$ estimate values are computed using the formula.

<table>
<thead>
<tr>
<th>Variable</th>
<th>t-ratio of Gain scores</th>
<th>$\omega^2$ est</th>
<th>100 $\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal-linguistic intelligence</td>
<td>2.5567</td>
<td>0.1405</td>
<td>14.05%</td>
</tr>
</tbody>
</table>

From table 4, it can be said that the $\omega^2$ estimate on variable Visual-spatial intelligence is 14.05%.

Figure 1: Pie Chart of Proportion of Variance in Gain Scores of Visual-spatial intelligence Due to intervention of the educational programme (Toolkit)

Figure 1 describes the Pie Chart of Proportion of Variance in Gain Scores of Visual-spatial intelligence Due to intervention of the educational programme (Toolkit). From the figure it can be inferred that the contribution of intervention of the educational programme (Toolkit) in the development of Visual-spatial intelligence is 14.05%. Thus it can be concluded that the intervention of the educational programme (Toolkit) has helped to enhance Visual-spatial intelligence among VIII standard students.
V. CONCLUSION & FINAL OUTCOMES OF THE STUDY

The mean of gain scores of Visual-spatial intelligence of experimental group is significantly higher than that of control group. Hence it can be inferred that there is a significant difference in the gain scores of Visual-spatial intelligence of experimental and control groups. These findings indicate that the gain scores of experimental and control groups differ significantly. It can thus be inferred that intervention programme organized has helped to develop Visual-spatial intelligence in the students of standard VIII of the experimental group. It can be inferred that the contribution of intervention of the educational programme (Toolkit) in the development of Visual-spatial intelligence is 14.05%. Thus it can be concluded that the intervention of the educational programme (Toolkit) has helped to enhance Visual-spatial intelligence among VIII standard students.

If we compare findings of this research with that of other researchers observations, Harward Gardner proponent of multiple intelligence theory has praised the efforts of several researchers and practitioners in "Educational Leadership" issue and issues a special challenge to each of them. The researchers believe that it is indeed a challenging task to enhance the multiple intelligences of students. The result of this research confirms the development of Visual-spatial intelligence 14.05%. It can be concluded that educational practitioner need to take many more professional endeavours to develop multiple intelligences of students.

VI. REFERENCES

AUTHOR’S BIOGRAPHY

Dr. (Mrs.) Mintu Sinha is the Principal of Bombay Teachers’ Training College since the year 2004. Dr. Sinha is a double post-graduate in political science and education, and a double Ph.D. as well, a unique achievement even amongst the teacher educators. She has also done a certificate course in Educational Leadership at the University of West Georgia, U.S.A. Moreover she has delivered lectures and presented research based paper at various conferences in India and abroad. She has been actively involved in improving quality and the standard of education in Mumbai University as the Chairperson, Board of Studies in Education; Member Academic Council; Member, Research and Recognition Committee; Member, Local Inspection Committee etc. She is a member of National Assessment and Accreditation Committee (NAAC), which evaluates the academic performance of Colleges of Education in India. Dr. Sinha is a recognized Ph.D. guide. She believes that quality and contents of Teacher education must be the focus of any thrust for improvement in the field of education. To this end, she has been thriving through various platforms and her efforts have brought many accolades to her college.

Dr. Bhagwan Balani is working as Assistant Professor at Bombay Teachers’ Training College since 2004. He has done his doctorate degree on developing a quality assurance model of teacher education programme. He has presented research based paper at various conferences in India. He has got the recognition as Teacher of the University (Post Graduate Teaching) for M. Ed. & M. A. Degree (by papers) in Education.

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