Academic Tracking: Dominance of Triarchic Skills

Rita C. Ramos
UP-Open School

The purpose of this paper is to determine the triarchic skills level (creativity, practical and analytical) and differences among different curriculum tracking. The study aims to determine the multiple correlates of triarchic skills among 4th year high school students. A descriptive correlational study was conducted in a national high school in Region III (Philippines) involving 195 respondents across different year level Stratified Proportional sampling was used to ensure that appropriate numbers of elements are drawn from homogenous subsets. Sternberg Triarchic Abilities Test version 1993) was administered. General Weighted Average and individual grades for each subject were also collected and documented. The National Career Assessment Examination (NCAE) results were also used and gathered. There was a significant difference Analytical among Special Science Curriculum with Basic Education Curriculum (p =.036) and Special Performing Arts (p=.000) but did not differ with Information and Communication Technology Curriculum. The SCC differed with ICT (p=.010) in terms of creative skills but not with two groups: BEC and SPA (p=.620 and p=.474). There was no significant difference among curriculum tracking in terms of practical skills. The different curriculum tracking differed only in terms of analytical and creative skills but not with practical skills.

Keywords: Triarchic theory, Academic tracking

It has been considered that intelligence is a cumulative effects of different factors as presented by several empirical studies. The nature of Intelligence is not itself a vacuum. The role of genetics, nutrition, and exposure to family, home and environment are some of its underlying reasons for the individual's level of intelligence (Neisser, Boodoo, Bouchard, Boykin, Brody, Ceci, Halpern, Loehlin, Perloff, Sternberg, & Urbina 1996). Sternberg (1997, 1999) posited several assumptions on theory of successful intelligence. The way success is defined is bounded by socio-cultural context. There is indeed no single perspective on the personal meaning of success. Each has its own way of defining it. Enriching one's potential or strength is what the theory stood for. Furthermore, the weaknesses are intended to be changed and improved as well. The fusion and balance of the triarchic skills an important main

assumption in his theory presented. Triarchic skills are composed of Analytical, Creative and Practical skills. Creative skills are directed toward putting together ideas; Analytical skills are geared on choosing the best of ideas and practical skills are helpful in carrying out the ideas (Sternberg 2006). In the study of Neisser et al (1996) concluded that there are many ways of defining intelligence and multitude of means to become intelligent.

It is noteworthy to consider the so called curriculum tracking in educational system. Curriculum tracking is defined as segregation of students according to curriculum standards, educational and career aspiration and ability levels. An empirical study noted that students who are tracked in less academically inclined curriculum tend to have limited occupational choices (Akos, Lambie, and Milsom & Gilbert 2007). Terwell (2005) concluded that high achieving students gain from high track while low achieving ones limit their potential. However in the contemporary views of intelligence, doing such will benefit students for curriculum tracking. Such preparation will match one's ability. This perhaps imply that the academic preparation may likely influence future career choice. Thus this espouses the assertion of successful Sternberg's Successful Intelligence that when one taught parallel to their ability and thinking they will perform better (Sternberg 2008). The theory implies working on the strength on one's individual instead of the weakness part. However the question whether the intended outcomes of curriculum tracking indeed reflective of the several variables. Does each curriculum tracking able to develop the triarchic skills? Does curriculum tracking able to maximize one' strength and maximum potential as it aimed for? Sternberg (2006) referred that intelligence is perceived as culturally and socially divergent. Individuals may not have all the skills but may have one or two that complements his or her weaknesses.

Curriculum tracking are as follows implemented in the said institution: Special Science Class otherwise known Engineering and Science Education Project was implemented with DECS Order No. 54 (1996) to provide a curriculum concentrated on pure sciences. Thus it primarily serves the high ability group which being referred to "intellectually gifted and science inclined students. Basic Education Curriculum (2002) is the restructured curriculum from 1983 Elementary Education and the 1989 Secondary Education Curriculum. This is comprised of five learning areas: Filipino, English, Science and Technology, Mathematics and lastly the "Makabayan ". The latter integrates different subject areas and coined "Laboratory of Life ". This curriculum introduced Integrated Science, Biology, Chemistry for the first until third year and two tracking (either Advanced Chemistry or Physics for fourth year. The Special Program in the Arts is intended for multi-artistically inclined students. This has the following specializations: Music, Visual Arts, Theater Arts, Creative Writing, Media Arts and Dance. Lastly, the Information and Communication Technology Curriculum aimed to keep paced with the computer technology. The four different curricula cater to diverse students' ability with emphasis on individual's strength. The common places for this diversified curriculum are the distinct outcomes, such as Special Science Curriculum (SCC) focused on pure sciences and prepared for Science based courses in the college. It is expected that the honing of strength will be relative to the outcomes. Thus the inquiry is aimed to determine on which among the triarchic abilities is significantly dominant in each curriculum tracking. Is it relative to its distinct outcomes outcomes in terms of triarchic skills namely: Analytical, Creative and Practical Skills?

This study is aimed to investigate the difference among curriculum tracking in terms of triarchic skills. This has the following objectives:

1. To determine the triarchic skills level (creativity, practical and analytical) among different curriculum tracking
   a. Special Science Curriculum
   b. Basic Education Curriculum
   c. Special Performing Arts
   d. Information and Communication Technology

2. To determine the difference in the triarchic skills (creativity, practical and analytical) among different curriculum tracking.
3. To determine the multiple correlates of triarchic skills among 4th year high school.

Methodology

There were 206 4th year high school students from a national high school in Region III. They were randomly selected from different curriculum : Special Science Class (*N*=65), Basic Education Curriculum (*N*=79), Information and Communication Technology (*N*= 35) and Special Performing Arts (*N*= 25). The data were collected within March 22 – 24, 2010. Only 195 of them were included for the data analysis. The exclusion of 11 cases was related to incomplete data (i.e. copy of grades). This may be related to ongoing computation and submission of grades at the time of data collection.

Stratified Proportionate Random Sampling was utilized for this survey to ensure that appropriate numbers of elements are drawn from homogenous subsets of that population instead of selecting a sample from a large total population. (Babbie, 2001). The total population per year level was known first before sampling took place. This ensured that the proportion of sample is based on the total population.

Measures

a. STAT (Sternberg Triarchic Abilities Test 1993 version) – this comprised of 36 items examination which has 9 subtests and collectively yield three basic scores.
   1. Analytic (subtest 1-3 multiple choice) - this consisted of analytical- verbal; analytical quantitative and analytical figural.
      a. Analytical- verbal (4 items) – students are supposed to substitute the artificial word of the appropriate word depending on the theme of the sentence.
      b. Analytical –quantitative (items) - student should supply the number in the number series pattern.
      c. Analytical Figural
   2. Creative (subtest 7-9 multiple choice) - this consisted of creative –verbal; creative quantitative and creative figural.
   3. Practical (subtest 4- 6 multiple choice)- this consisted of practical –verbal; practical quantitative and practical figural

Separate scores may be obtained

1. Verbal (subtest 1. 4 & 7)
2. Quantitative (subtest 2, 5 & 8)
3. Figural (subtest 3, 6 & 9)

b. General weighted Average (1st to 4th year high school) and Individual report of subjects (1st to 4th year) - this was obtained through computing of individual report of subjects as reflected in secondary student's permanent record. This is referred as B.P.S. Form 137-A wherein it contains the periodic ratings across year level (from 1st year to 4th year high school). This record contains personal information from the students like place of birth, parent or guardian, address and occupation. Extra Curricular activities and honors received were also asked and documented.
c. National Career Assessment Examination - This has the following subsets namely: clerical ability, manipulative skill, technical – vocational aptitude, non verbal ability, entrepreneurial skill, scientific ability, reading comprehension, verbal ability, mathematical ability and general scholastic aptitude. This aimed to improve the quality of secondary education graduates entering college and to lead the flow of students to courses in post secondary institutions of learning matching their aptitude. This aimed to diagnose and direct secondary education graduates to post secondary that match their aptitude. This is still in the recommendary status at current. However the implementation will be on its third year and with appropriate law.

Data Collection Method

A letter of permission was sent and approved by the school principal. The data collection was conducted last March 24 and 25, 2010 in Olongapo City National High School. The following participants took the examination (STAT) (SCC= 65, BEC=79, ICT=37 and SPA =25). Two teachers facilitated the distribution and administration of STAT (Sternberg's Triarchic Ability Test) guided by the test instructions. This took them two consecutive days to accomplish the target number of participants due to availability of participants. The test papers were later checked and encoded for further analysis. Reliability was also analyzed yielding a cronbach alpha of .7012.

National Career Assessment Examination (NCAE) results were requested and approved from the office Testing and Evaluation Office of Olongapo City National High School. This was released and distributed only on the first week of March prior to STAT administration.

The master's list was provided and forwarded thus necessitated to look for individual names among the 195 participants. Data on the following were retrieved and documented: Scientific Ability (SA), Reading Comprehension (RC), Verbal Ability (VA), Math Ability (MA), General Scholastic Aptitude (GSA), Clerical Ability (CA), Manipulative Skills (MS), Technical Vocational Aptitude (TVA), Non Verbal Ability (NVA) and Entrepreneurial Skill (ES).

General Weighted Average and Records of Academic subjects of those who took the STAT were requested and approved by the principal. The records of those who took the STAT were retrieved from the level coordinator .Only those whose permanent records were available by the time of data retrieval were included (*N*=195). Pertinent data were encoded specifically: Name, curriculum tracking,

guardians' occupation, and all subjects' grades from first year to fourth year. General weighted average was computed.

Statistical Treatment

SPSS for Windows (version 11.5, SPSS Inc, Chicago, Illinois) was the statistical software used in this study.

Means and Standard Deviations. These were used to answer research objective no. 1 (To determine the triarchic skills level among different curriculum tracking).

Analysis of Variance (ANOVA). This was used to answer research objective no. 2 (To determine the difference in the triarchic skills across different curriculum). This statistical treatment is appropriate to answer whether the group means differ from each other (Munro, 2001). The independent variable (often called factor) has two or more levels. Curriculum tracking is a variable with four levels (SCC, BEC, SPA and ICT). The dependent variable (STAT scores) is a continuous variable. It satisfied the assumptions of ANOVA namely that STAT is continuous and normally distributed (Analytical skills -.084, Creative Skills - .612 and Practical -.005). Multiple group comparison was used specifically Scheffe for post hoc test. This was used to determine of which among groups are different. *F* test alone cannot determine which groups differ from each other (Munro, 2001). Scheffe is commonly used and reported in empirical studies. This was used to answer Research Objective no. 4 (To determine the difference in the NCAE across different curriculum).

Multiple Regression. This was used to answer Research Objective no. 3 (To determine the multiple correlates of triarchic skills among fourth year high school students). This was used to predict outcomes and explain the interrelationships among variables (Munro, 2001). Curriculum tracking was dummy recoded into the following : SCC= 1, BEC and SPA = 0; BEC = 1, SCC and SPA ; SPA =1 , BEC, and SPA = 0.

Results

The following are presented and arranged according to the objectives presented.

Research Objective 1: To determine the triarchic skills (creativity, practical and analytical) among different curriculum tracking.

The table 1 shows the means, *SD*s of the STAT (Analytical Skills) across different curriculum tracking. According to these data, the SCC scored higher in this area (*M*=10.38) has the highest mean among the four groups. Variability was consistent across curriculum tracking (*SD* ranges from 1.095 to 2.478).This would imply that the sample for each group are homogenous. Furthermore, the skewness and kurtosis measures were small, .084 indicating the normal distribution. This has been revealed in the visual inspection of the graph.

Table 1
Standard Deviations and n for Analytical Skills

Curriculum Tracking	*n*	*M*	*SD*
Special Science C	64	10.38	2.478
BEC	78	9.09	3.059
SPA	20	7.35	1.531
ICT	33	10.55	1.095

The table 2 shows the means, *SD*s of the STAT (Creative) across different curriculum tracking. According to these data, the SCC scored higher in this area (*M*=3.72) has the highest mean among the four groups. Variability was constant across curriculum tracking (*SD* ranges from 1.146 to 2.066). The scores assumed a normal distribution with skewness of .612.

Table 2
Descriptive Statistics for Creative Skills

Curriculum Tracking	*n*	*M*	*SD*
Special Science C	64	3.72	2.066
BEC	78	3.32	1.702
SPA	20	3.00	1.835
ICT	33	2.42	1.146

The table 3 shows the means, *SD*s of the STAT (practical skills) across different curriculum tracking. According to these data, the SCC scored higher in this area (*M*=4.22) has the highest mean among the four groups. Variability was constant across curriculum tracking (*SD* ranges from 1.496 to 1.600). This assumed a normal distribution with skewness of -.005.

Table 3
Standard Deviations and n for Practical Skills

Curriculum Tracking	*n*	*M*	*SD*
Special Science C	64	4.22	1.496
BEC	78	3.92	1.421
SPA	20	3.94	1.119
ICT	33	4.02	1.600

Research Objective no. 2: To determine the difference in the triarchic skills (creativity, practical and analytical) among different curriculum tracking.

The table shows that there was a significant difference between analytic skills and curriculum tracking, *F* (3, 191) =9.510, *p*= .000.The table 4 shows the number of subjects, the mean, and the standard deviation of analytic skills for each cell. A multiple comparison (Scheffe) test indicated that the group difference accounting for the significant *F* value was for the SCC with BEC (*p*=.036) and SPA (*p*=.000) but did not differ significantly with ICT (*p*= .992). The SCC tracking scored higher (*M*=10.38) than BEC group (*M*=9.09) and SPA (*M*=7.35). Special Science Curriculum otherwise known globally as Science Enriched Curriculum .Science

courses are aimed to critically and logically choose ideas through scientific means. Thus, having the discipline likely will improve ones analytical skills.

Brody (2001) stated that analytical ability is relative to the academic achievement. It can be concluded based on the report grade from the SCC and ICT students that they have higher General Weighted Average and NCAE scores. Thus this findings support the hypothesis.

Table 4
Analysis of Variance for Analytic Skills

Variable and Source	*df*	*F*	*p*
Between Groups	3	9.510	.000
Within Groups	191		

The table shows that there was a significant difference between creative skills and curriculum tracking, *F* (3, 191)=4.062, *p*=.000.The table 5 shows the number of subjects, the mean, and the standard deviation of analytic skills for each cell. A multiple comparison (Scheffe) test indicated that the group difference accounting for the significant *F* value was for the SCC with ICT (*p*=.010) but not with the two groups: BEC and SPA (*p*=.620 and *p*=.474). The SCC tracking scored higher (*M*=3.72) than BEC group (*M*=3.32) and SPA (*M*=3.0). Creativity is considered as a desolated area in information systems field (Higgins & McIntyre, 1993). There was a predominance of use of analytical techniques. This would support the group difference between SCC and ICT tracking. Special Science Curriculum, Basic Education Curriculum and Special Performing Arts may have been similar to creative aspects. The so called "laboratory of life "introduced in the subject Makabayan in Basic Education Curriculum where it integrates different subjects like Physics and Chemistry to each year level.

Table 5
Analysis of Variance for Creative Skills

Source	*Df*	*F*	*p*
Between Groups	3	4.062	.000
Within Groups	191		

The table shows that there was no significant difference between practical skills and curriculum tracking, *F* (3, 191) =5.96, *p*=.96.The table 6 shows the number of subjects, the mean, and the standard deviation of analytic skills for each cell. This can be attributed to the homogeneity of the sample. It is said to be that problem solving skills are likely to improve at the later adulthood. Early adulthood is more focused on traditional cognitive abilities (Sternberg, Wagner, Williams, & Horvath, 1995). Tacit knowledge is composed of three defining characteristics namely: procedural, attainment of goals personal value and independence. Results from a landmark study supported that depth and breadth of experience may influence problem solving skills (Warren & Sternberg, 1985). With this empirical data, it can be concluded those 15 to 17 years old of age as the age

ranges of the participants in this study that it is likely to expect homogenous level of practical skills.

Brody (2001) accounted the contribution of practical intelligence to academic achievement to be quite small. This strengthened and espoused the insignificant result of this hypothesis. One of the empirical assertions of Practical Intelligence is independence. It is not related with academic intelligence (Gottfredson, 2002). This may be one of the reasons that despite of the different tracking practical skills remained insignificant.

Table 6
Analysis of Variance for Practical Skills

Source	*df*	*F*	*P*
Between Groups	3	5.432	.001
Within Groups	191		

Research Problem 3: To determine the multiple correlates of triarchic skills (Analytical, Creative and Practical) among fourth year highs school students.

Multiple regressions were conducted to determine the best linear combination for predicting analytical skills. This combination of variables significantly predicted analytic skills, F (6, 185) = 19.04, $p < .05$, with six variables significantly contributing to analytic skills. The beta weights, presented in table 7 suggest that high general weighted average (4th year), nonverbal, verbal ability and being in Special Science Curriculum (SSC) and Information Computer Technology (ICT) tracking also contribute to the prediction. This indicates that 36 % of the variance in analytic skills was explained by the model.

Table 7
Simultaneous Multiple Regression Analysis Summary for Predicting Analytical Skills

Variable	*B*	*SEB*	*ß*
Basic Education Curriculum	-.815	.398	-.148
Special Performing Arts	-2.407	.613	-.273
Verbal Ability	.038	.010	.271
Non Verbal Ability	.020	.008	.178
GWA 3rd year	-.412	.217	-.427
GWA 4th year	.624	.220	.641
Constant	-12.434	5.258	5.258

Note. R^2= .382; F(6,185)=19.04, p<.05

Multiple regressions were conducted to determine the best linear combination for predicting creative skills. This combination of variables significantly predicted creative skills, *F* (6, 185) = 19.04, *p* < .05, with six variables significantly contributing to analytic skills. The beta weights, presented in table 8 suggest that high in mathematical ability, clerical ability, 3rd year general weighted average and being in Basic Education Curriculum (BEC) and Special Performing Arts (SPA) tracking also contribute to the prediction. This indicates that 15 % of the variance in creative skills was explained by the model.

Table 8
Simultaneous Multiple Regression Analysis Summary for Predicting Creativity Skills

Variable	*B*	*SEB*	*ß*
Special Science Curriculum	.716	.380	.187
Basic Education Curriculum	.812	.356	.220
Special Performing Arts	1.330	.496	.225
Mathematical Ability	.021	.007	.256
Clerical Ability	.011	.006	.130
GWA 3rd year	.080	.124	.124
Constant	-6.506	4.057	

Note. $R^2 = .174$;
$F(6,185) = 6.493$
$p < .05$

Multiple regressions were conducted to determine the best linear combination for predicting practical skills. This combination of variables significantly predicted practical skills, *F* (6, 185) = 19.04, *p* < .05, with six variables significantly contributing to practical skills. The beta weights, presented in table 9 suggest that high mathematical ability and manipulative skills also contribute to the prediction. This indicates that 15 % of the variance in practical skills was explained by the model. The finding is similar to Sternberg (2006) where it yielded a significant relationship between SAT- Math and practical abilities.

Table 8
Simultaneous Multiple Regression Analysis Summary for Predicting Practical Skills

Variable	*B*	*SEB*	*ß*
Mathematical Ability	.012	.005	.195
Manipulative Skills	.019	.008	.308
Techno Vocational Skills	-.07	.009	-.248
Constant	3.159	.387	

Note. R^2= .246; F(3, 190)=4.081 p<.05

Discussion

This study espouses some assumptions of curriculum tracking utilizing the framework of Sternberg's Successful Intelligence. The triarchic skills comprised of analytical, creative and practical skills. The three seemingly are independent to each other in terms of curriculum tracking. . Special Science and Information Computer Technology curriculum are both high in analytical and divergent from Basic Education and Special Performing Arts. The results are relative to the goals and objectives of their tracking. Science inclined tracking are provided with more complexed problem solving, thus this trained them to be more critical and analytical. Likewise with Information Computer Technology, they were also regarded high ability students as reflected in their entrance examination. This would just support the triarchic ability of analytical skills of Sternberg,

The creative skills of Special Performing Arts, Basic Education Curriculum and Special Science Curriculum are parallel to each other. It is noteworthy to consider that the three are indeed different from Information and Computer Technology. The result may imply that computer tracking may be lacking in creativity given the nature.

However the practical skills are homogenous among curriculum tracking. The age of the participants are almost similar and close to each other. Practical skills can be more pronounced to older adults.

Conclusion

Triarchic skills specifically analytical and creative differ across curriculum tracking. Practical skills remained not significant across curriculum tracking. General weighted Average for (fourth year), nonverbal, verbal ability, being in Special Science Curriculum and in Information Computer Technnology contributed in the prediction of analytical skills. Furthermore high in mathematical ability, clerical ability and general weighted average (3rd year, being in Basic Education Curriculum and Special Performing Arts predicted creative skills. Practical skills have the following predictors such being high in mathematical ability and manipulative skills.

References

Akos, P. G. (2007). Early adolescents'aspirations and academic tracking: An exploratory investigation. *ASCA: Professional School Counselling, 11*(1), 57-65.

Babbie, E. (2001). *The practice of social research*. Belmont, CA: Wadsworth/Thomson Learning.

Brody, N. (2003). Construct validation of the Sternberg triarchic abilities test comment and reanalysis. *Intelligence 31 , 31*, 319-329.

Daniel, L. F. (1993). (Un)Structured creativity in information systems organizations. *MIS Quarterly, 4*, 375-397

Gottfredson, L. S. (2003). Dissecting practical intelligence theory: Its claims and evidence. *Intelligence, 31,* 343-397.

Koke, L. C., & Vernon P.A. (2003). The Sternberg triarchic abilities test (STAT) as a measure of academic achievement and general intelligence. *Personality and Individual Difference*, *35*, 1803-1807.

Munro, B. (2001). *Statistics for health care*. New York, NY. McGraw-Hill Companies, Inc.

Neisser, U. B. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77-101.

Sternberg, R. J. (1999). A triarchic approach to the understanding and assessment of intelligence in multicultural population. *Journal of School Psychology, 37*(2), 145-159.

Sternberg, R. J. (2006). The rainbow project: Enhancing the SAT through assessments of analytical, practical, creative skills. *Intelligence, 34,* 321-350.

Sternberg, R. W. (1995). Testing Common Sense. *American Psychologist, 50*(11), 912-927.

Sternberg, R. J. (2008). Applying psychological theories to educational practice. *American Educational Research Journal, 45*(1), 150-165.

Sternberg, R. (2003). What is an "expert student? *Educational Researcher, 32*(8), 5-9.

Sternberg, R. J. (2006). How can we simultaneously enhance both academic excellence and diversity. *College and University, 82*(1), 3-9.

Olongapo City National High School website retrieved April 4, 2010

Department of Education retrieved April 14, 2010 http://www.deped.gov.ph/