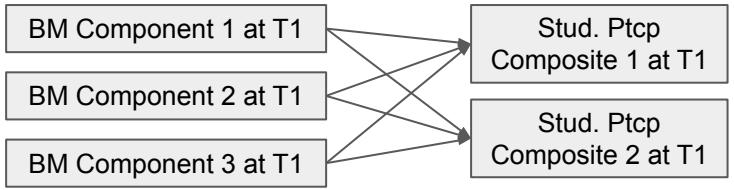
Analytic Techniques and Procedures for Answering the Research Questions of Cohort 1 Benchmark Impact Study (Draft)

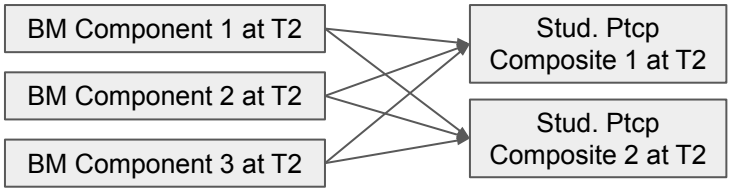
Dr. Katty P. Ho
February 21-, 2023

Notes.

- BMs = Hong Kong Benchmarks for CLD Education for assessing the school's levels of achievements in CLD education through policy, teacher competence, counseling, whole-school approach, internship, future education exposure, student-led approach, and parent involvement
- Student participation (stud. ptcp) = Self-reported frequency ratings of students' participation in the school's CLD education programs and activities
- Student outcomes = Measures of students' social-affective constructs through the APASO-II and measures of career readiness attitude and behavior
- T1 = Time 1, 2021
- T2 = Time 2, 2022
- Increase = Difference between T1 measure and T2 measure (T2 measure minus T1 measure)
- EFA = Exploratory factor analysis
- CFA = Confirmatory factor analysis
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn & Bacon.

First Set of Research Questions



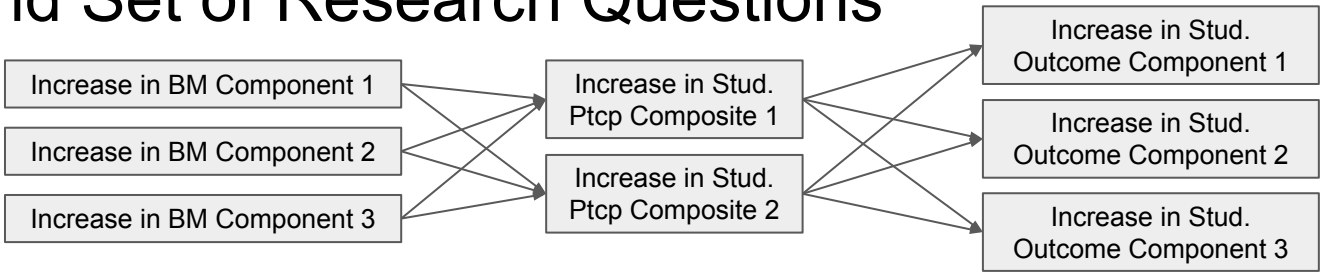


- Can the BMs at T1 predict student participation at T1 (pre-intervention)?
  - If so, which ones? Which factors?
  - Which grade levels/secondary forms?
- Can the BMs at T2 predict student participation at T2 (post-intervention)?
  - If so, which ones? Which factors?
  - Which grade levels/secondary forms?
- How does the picture at T1 differ from the picture at T2 as an indication of the *intervention effect*?

Data Analytic Techniques & Procedures:

- 1A. EFA on all items of each BM (T1) to identify the underlying factors to be used as predictors (Mar 6-9, 2023)
- 1B. EFA on all items of each BM (T2) to identify the underlying factors to be used as predictors (Mar 6-9, 2023)
- 1C. Principal Component Analysis on all the factors identified to reduce the number of BM predictors (T1) in the later MRA (Mar 10-12, 2023)
- 1D. Principal Component Analysis on all the factors identified to reduce the number of BM components as predictors (T2) in the later MRA (Mar 10-12, 2023)
- 2A. EFA on student participation items at T1 per secondary form (optional): Do they converge? (Mar 13, 2023)
- 2B. EFA on student participation items at T2 per secondary form (optional): Do they converge? (Mar 13, 2023)
- 2C. Bivariate statistics on the relationship between BM components and student participation composites (Mar 14, 2023)
- 3. Multiple Regression Analysis (MRA) with the reduced number of BM components as predictors on each student participation composite as the DV (Mar 14, 2023)

Second Set of Research Questions



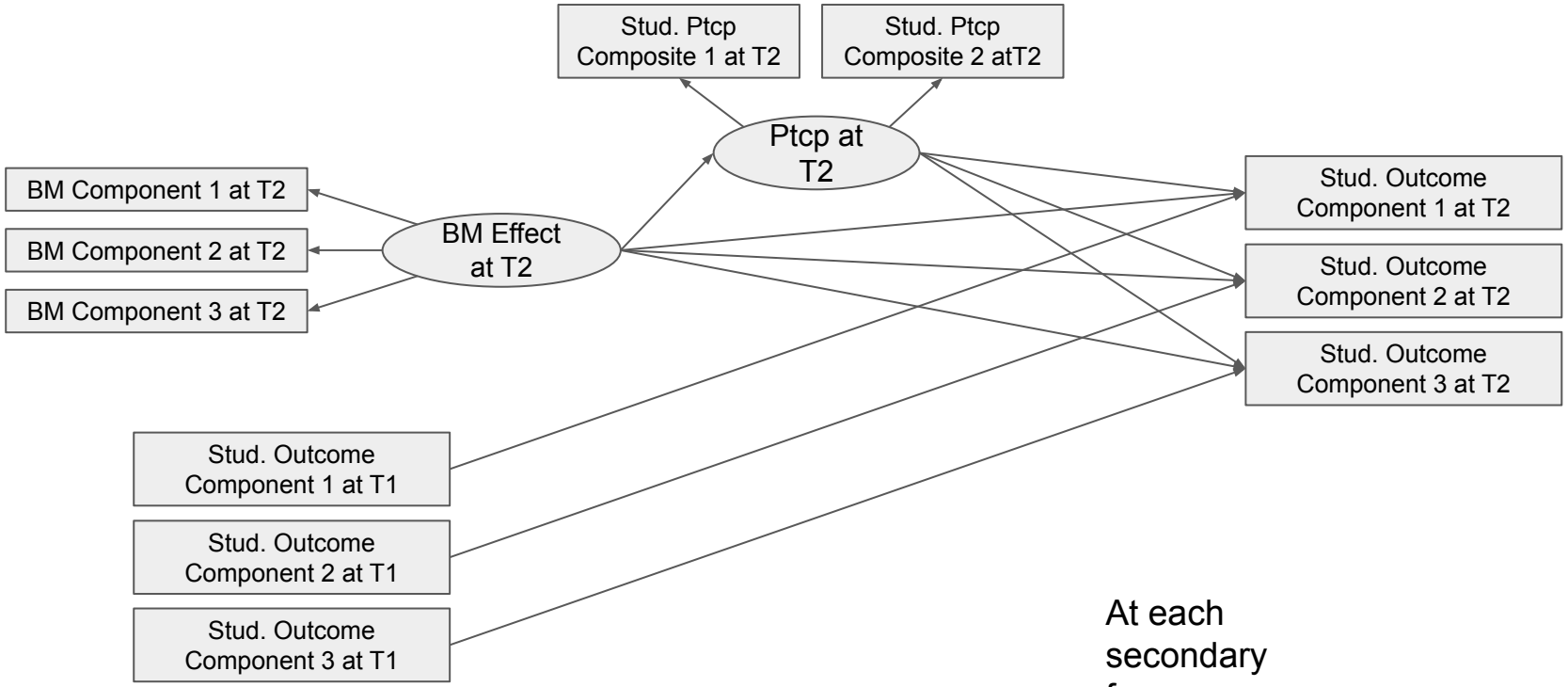
At each secondary form

- Can the Improvements in the school's BMs (from T1 to T2) predict student improvement on participation (from T1 to T2)?
- Does student improvement in participation (from T1 to T2) predict student improvement in social-affective-career attitudinal-behavioral outcomes?
- Do the Improvements in BM Components have any predictive effects on the improvement in student outcome components after adjusting for the improvement in student participation composites at each secondary form?

Data Analytic Techniques & Procedures:

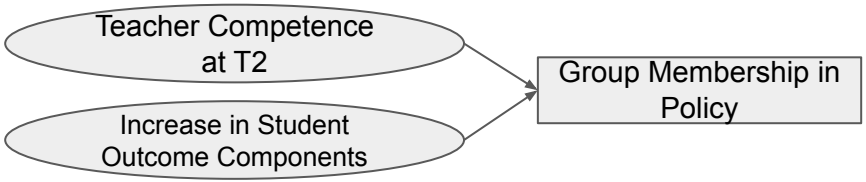
- 1A. Compute Increase variables for each item per BM (Mar 15, 2023)
- 1B. Compute Increase in BM Components based on previous EFA results (Mar 15, 2023)
- 1C. Compute Increase variables for each student participation item and each student participation composite (Mar 16, 2023)
- 1D. Principal Component Analysis on all student outcome subscales to reduce the number of variables as DVs based on the students' T1 data set (Mar 16, 2023)
- 2A. Merge same-students data set with BM variables (Mar 17, 2023)
- 2B. Sequential (Hierarchical) Regression Analysis with increase in student participation composites (1st set of IVs) entered first and the Increase in BM Components (2nd set of IVs) entered next to predict each student outcome component at each secondary form (based on the same-students data set of N = 998) (Mar 17, 2023)
- 3. Sequential (Hierarchical) Regression Analysis with student outcome components at T1 entered first (1st set of IVs to be adjusted for), student participation composites at T2 (2nd set of IVs) entered next, and the BM Components at T2 (3rd set of IVs) entered third to predict each student outcome component at T1 at each secondary form (based on the same-students data set of N = 998) (Mar 20, 2023)

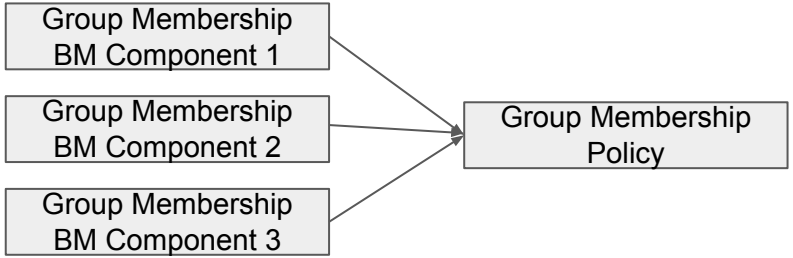
Second Set of Research Questions (cont'd)



At each secondary form

Third Set of Research Questions





- Types of Improvements in BMs at T2
  - Policy
  - Teacher Competence
  - Counseling
  - Whole-School Approach
  - Internship
  - Further Education Exposure
  - Student-Led
  - Parents Involvement
- Group membership on levels of School Achieved-ness in Policy: 100% (3), High-to-Medium (2), Low-to-No (1)
- Prediction of group membership in Policy by Increase in student outcome components (1st set of IVs) and by teacher competences at T2 (2nd set of IVs)
- Group Memberships in BM Components predicting Policy Group Membership (via Logic Analysis)

Data Analytic Techniques & Procedures:

- 1A. Create Grouping Dummy Variables based on hypotheses
- 2. Discriminant Analysis
- 3. Logit Analysis

Check for Normality of Variables to Correct Skewness in Distribution (to get better prediction result) (Tabachnick & Fidell, 2007, ch. 4, p. 87)

- If distribution differs <u>moderately</u> from normal (when skewness is btw -1 and -.5 or btw .5 and 1):
  - If right-skewed (with a right tail, a lot of lower values lower than the mean, and a positive skewness value): **use Square Root transformation**
  - If left-skewed (with a left tail, a lot of higher values higher than the mean, and a negative skewness value): **use Reflect* and Square Root transformation**
- If distribution differs <u>substantially</u> from normal (distribution is highly skewed when skewness < -1 or > 1):
  - If right-skewed (with a right tail, a lot of lower values lower than the mean, and a positive skewness value): **use Logarithm transformation**
  - If left-skewed (with a left tail, a lot of higher values higher than the mean, and a negative skewness value): **use Reflect and Logarithm transformation**
- If distribution differs <u>severely</u> from normal (distribution looks like a J shape):
  - If right-skewed (with a right tail, a lot of lower values lower than the mean, and a positive skewness value): use **Inverse** transformation**
  - If left-skewed (with a left tail, a lot of higher values higher than the mean, and a negative skewness value): use **Reflect and Inverse transformation**
- If skewness is btw -.5 and .5, distribution is approx. normal

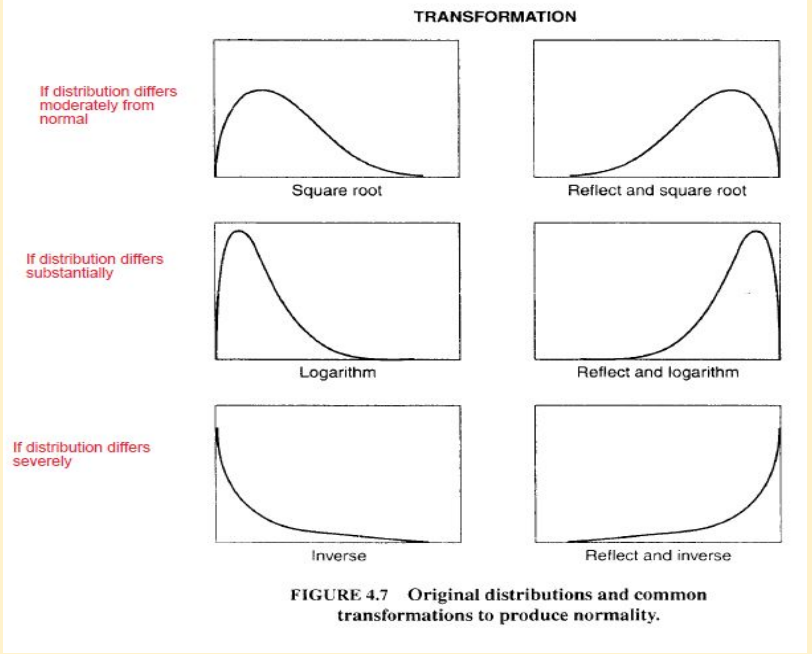


FIGURE 4.7 Original distributions and common transformations to produce normality.

* Excerpt from p. 88: If there is negative skewness, the best strategy is to reflect the variable and then apply the appropriate transformation for positive skewness. To reflect a variable, find the largest score in the distribution and add one to it to fom a constant that is larger than any score in the distribution. Then create a new variable by subtracting each score from the constant. In this way, a variable with negative skewness is converted to one with positive skewness prior to transformation. When you interpret a reflected variable, be sure to reverse the direction of the interpretation as well (or consider *rereflecting* it after transformation).
Videos on How to Create a Reflect Var and Transform it:
https://www.youtube.com/watch?v=gZ2QazXbri8 ;
https://www.youtube.com/watch?v=kgvKGOqsPd8
** Inverse: X→1/X

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13)

- Goal 1 (motivation behind extraction) of PCA or FA = discover the **minimum** number of factor axes needed to reliably position variables" (p. 642)
- Goal 2 = discover the **meaning** of the factors that underlie responses to observed variables (interpret the factor axes) (p. 642)
- **FA (factor analysis)** =
  - produces *factors*;
  - theoretical;
  - "Factors 'cause' variables";
  - **Factor** = is the underlying construct that produces scores on the variables
  - "Tests theory about underlying processes"
- **PCA (principal component analysis)** =
  - produces *components*;
  - empirical;
  - "Components are simply aggregates of correlated variables" (p. 610);
  - **Component** = is produced/caused by the variables
  - "Describes concisely (or understand) the relationships among the observed variables"

- (In) FA:
  - "only the variance that each observed variable shares with other observed variables is available for analysis" (p. 635)
  - "Community values (numbers between 0 and 1) replace 1's in the positive diagonal of R before factor extraction. Communality values are used instead of 1's to remove the unique and error variance of each observed variable; only the variance a variable shares with the factors is used in the solution" (p. 643)
  - SCM of each variable as DV with others in the same as IVs is the starting estimate of communality (p. 643);
  - "Final communality values represent the proportion of variance in a variable that is predictable from the factors underlying it" (p. 643)
  - Process: Analyzes covariance (communality)
  - Goal: Reproduces the correlation matrix with a few orthogonal factors
  - Yields theoretical solution uncontaminated by unique and error variability; on the basis of underlying constructs that are expected to produce scores on your observed variables
- (In) PCA:
  - "1's are in the diagonal and there is as much variance to be analyzed as there are observed variables" (p. 635)
    - "All the variance is distributed to components, incl. error and unique variance for each observed variables" (p. 635)
    - "If all components are retained, PCA duplicates exactly the observed correlation matrix and the standard scores of the observed variables" (p. 635)
    - "Each variable contributes a unit of variance by contributing a 1 to the positive diagonal of the correlation matrix" (p. 635)
  - Process: Analyzes variance
  - Goal: Extracts maximum variance from a data set with a few orthogonal components; **for reducing a large number of variables down to a smaller number of components**
  - Yields an empirical summary of the data set
  - Principal Components = are ordered; "with the 1st component extracting the most variance and the last component the least variance"
  - Solution is mathematically unique; "since the components are orthogonal, their use in other analyses (e.g., DVs in MANOVA) may greatly facilitate interpretation of results" (p. 635)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- Marker variable = variable highly correlated with one and only one factor (> .80)
  - Complex variable = one that is correlated with several factors
  - "Complexity is indicated by the number of factors with which a variable correlates" (p. 612)
  - "Estimating (or avoiding) the complexity of variables is part of generating hypothesis about factors and selecting variables to measure them" (p. 612).
- "Underlying factor structure may shift in time for the same subjects with learning or with experience in an experimental setting" (p. 612)
- Poorly distributed (e.g., skewed) variables may undergo transformations to enhance FA.
- Sample size:
  - 1000 = excellent; 500 = very good; 300 = good; 200 = fair; 100 = poor; 50 = very poor
  - Rule of thumb = at least 300 cases; If there are high loading marker variables (> .80) = ~ 150; under some circumstances = 100 or even 50
- Missing data = either estimated, deleted of the entire case, or analyzed with the missing data pairwise correlation matrix
- Multivariate normality and linearity are assumed
- PCA = Multicollinearity is not a problem
- FA = Singularity or Extreme Multicollinearity is a problem; Singularity prohits matrix inversion; Multicollinearity renders unstable matrix inversion
  - SMC = "the squared multiple correlation of a variable where it serves as DV with the rest as IVs in multiple correlation" (p. 90)
  - Singularity = variables are redundant (e.g., a variable is a combination of more of the other variables) (p. 88); "If the SMC is 1, the variable is perfectly related to others in the set and you have singularity" (p. 90)
  - Multicollinearity = variables are very highly correlated (.90+) (p. 88); "If the SMC is high, the variable is highly related to the others in the set and you have multicollinearity" (p. 90); "they are not all needed in the same analysis" (p. 89); they provide redundant information
  - "Singularity and multicollinearity can be identified in screening runs through perfect or very high squared multiple correlations (SMC) among IVs" (p. 124)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- Tolerance (= 1 – SMC) = "It the tolerance … is too low [lower than .0001], the variable does not enter the analysis"; "Default tolerance levels range between .01 and .0001" (p. 90)
- **Factorability of R** = "A matrix that is factorable should include several sizable correlations" (p. 614)
    - "Larger sample sizes tend to produce smaller correlations" (p. 614)
    - "If no correlation exceeds .30, use of FA is questionable because there is probably nothing to factor analyze" (p. 614)
- "Factors that are defined by just one or two variables are not stable" (p. 615)
- "A variable with a low SMC with all other variables and low correlations with all important factors is an outlier among the variables" (p. 615)
    - should be ignored or deleted in the current FA
- Extraction:
    - "Only the first two factors, with values over 1.00, are large enough to be retained in subsequent analyses" (p. 617)
    - Factor Loading Matrix = matrix of correlations between factors and variables
- **Orthogonal Rotation** = Varimax = (used after extraction) "to maximize the variance of factor loadings by making high loadings higher and low ones lower for each factor" (p.. 620)
    - "Emphasizing differences in loadings facilitates interpretation of a factor by making unambiguous the variables that correlate with it" (p. 620)
    - **Varimax Rotation** = "reapportion variance maong factors, so that they become relatively equal in importance; variance is taken from the first factors extracted and distributed among the later ones" (p. 638)
- Communality for a variable = variance accounted for by the factors; = the SMC of the variable as predicted from the factors (e.g., "50% of the variance in the variables is accounted for by the first factor" [p. 621])
    - Proportion of variance in the solution accounted for by a factor (proportion of covariance) = the SSL (sums of squared loadings) for the factor divided by the sum of communalities (p. 621)
- Residual Correlation Matrix = difference between the observed correlation matrix and the reproduced correlation matrix
- Factor Scores = a product of standardized scores on variables and factor score coefficients (p. 623); scores on factors are predicted for each case; regression-like coefficients are computed for weighting variable scores to produce factor scores
    - "The sum of standardized factor scores across subjects for a single factor is zero" (p. 624)
    - "Predicted standardized scores on variables are a product of scores on factors weighted by factor loadings" (p. 624)
- "A score on an observed variable is conceptualized as a properly weighed and summed combination of the scores on factors that underlie it" (p. 625)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Oblique Rotation** =
  - Loading Matrix becomes the Pattern Matrix
  - **Pattern Matrix** = **unique** relationships between factors and variables after Oblique Rotation = to better understand the dimensions underlying the variables
    - "Values in the Pattern Matrix, when squared, represent the unique contribution of each factor to the variance of each variable but do not include segments of variance that come from overlap between correlated factors" (p. 625)
    - "Most researchers interpret and report the Pattern Matrix rather than the Structure Matrix" (p. 627)
  - **Structure Matrix** (After Oblique Rotation) = **unique** relationships between factors and variables plus **overlapping** variance among factors = the correlations between variables and factors assessing the unique relationship between the variable and the factor "plus the relationship between the variable and the overlapping variance among the factors" (p. 627)
  - Reproduced Correlation Matrix = a product of the Structure Matrix and the transpose of the Pattern Matrix
  - The Residual Correlation Matrix is generated to diagnose adequacy of fit in FA (p. 628)
  - **Promax Rotation** = an orthogonal rotated solution (usually Varimax) is rotated again to allow correlations among factors; "Even though factors correlate, simple structure is maximized by clarifying which variables do and do not correlate with each factor" (p. 640)

- SMCs for each variable = labeled Initial in the Communalities
- Final Extraction Communalities = portion of variance in each variable accounted for by the solution (h^2)
- Variance accounted for by the factors (Total Variance Explained) = Initial Eigenvalues, % of Variance, Percent of Variance Cumulated over the factors (Cumulative %)
  - E.g., Percent of variance (sums of squared loadings) accounted for by the two factors extracted with eigenvalues greater than 1, after extraction and after rotation (p. 628)
- Unrotated Factor (Loading) Matrix
- Rotated Factor Matrix
- Factor Transformation Matrix (for orthogonal varimax rotation with Kaiser normalization)
- Factor Pattern Matrix = contains unrotated factor loadings for the first two factors
- SSLs for each factor = in the table labeled Variance Explained by Each Factor
- Final Communality Estimates (h^2) and Total h^2
- Orthogonal Transformation Matrix for rotation
- Rotated Factor Loadings in the Rotated Factor Pattern Matrix

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Factor Extraction Techniques*** =
  - **Principal Components (PCA) = maximize variance** extracted by orthogonal components
    - "The first principal component is the linear combination of observed variables that maximally separates subjects by maximizing the variance of their component scores" (p. 635)
    - "The second component is formed from residual correlations; it is the linear combination of observed variables that extracts maximum variability from residual correlations and are orthogonal to all previously extracted components" (p. 635)
  - Principal Factors = maximize variance extracted by orthogonal factors to attempt to eliminate unique and error variance from variables (if data is non-normal; communality stands on the diagonal, i.e., EFA)
  - Image Factoring = provides an empirical factor analysis to generate a mathematically determined solution with error variance and unique variance eliminated
  - Maximum Likelihood Factoring = estimates factor loadings for population that maximize the likelihood of sampling the observed correlation matrix to provide significance test for factors and be useful for CFA (if data is normal)
  - Alpha Factoring = maximizes the generalizability of orthogonal factors
  - Unweighted Least Square Factoring = minimizes squared residual correlations
  - Generalized (Weighted) Least Square Factoring
- **Procedures**:
  - **Step 1: Run an FA using Principal Component Extraction and Varimax Rotation:** "Most researchers begin their FA by using Principal Components Extraction and Varimax Rotation" (p. 642)
  - **Step 2: Check for Factorability of the Correlation Matrix (in the output); look for sizable correlations (> .30)**: "From the results, one estimates the factorability of the Correlation Matrix, the rank of the observed correlation matrix, the likely number of factors, and variables that might be excluded from subsequent analyses (p. 642)
  - **Step 3: Experiment with different number of factors, extraction methods, types of rotation by rerunning FA and interpreting the "best" solution:** "During the next few runs, researchers experiment with different numbers of factors, different extraction techniques, and both orthogonal and oblique rotations" (p. 642)
    - "Some number of factors with some combination of extraction and rotation **produces the solution with the greatest scientific utility**, **consistency, and meaning**; this is the solution that is interpreted" (p. 642)

*** Read this:**
https://stats.stackexchange.com/questions/50745/best-factor-extraction-methods-in-factor-analysis

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Procedures**: (cont'd)
  - **Step 4: Check the Estimates of Communalities (Between 0 and 1) (not above .9999) (= SMCs for each variable)**
    - Adjusted by iterative procedures to fit the reproduced to the observed correlation matrix with the smallest number of factors (p. 643)
    - Iteration stops when successive communality estimates are very similar
    - If the number of variables exceeds 20, sample SMCs probably provide reasonable estimates of communality
    - If communality values equal or exceed 1, problems with the solution are indicated; adding or deleting factors may reduce the communality below 1;
    - Very low communality values indicate that the variables with them are unrelated to other variables in the set
  - **Step 5: Estimate the number of factors that have an eigenvalue greater than 1:** "A first quick estimate of the number of factors is obtained from the sizes of the eigenvalues reported as part of an initial run with principal components extraction" (p. 644)
    - "Eigenvalues represent variance. Because the variance that each standardized variable contributes to a principal components extraction is 1, a component with an eigenvalue ***less than 1 is not as important*** …" (p, 644)
    - "The **number of components with eigenvalues greater than 1** is usually somewhere between the number of variables divided by 3 and the number of variables divided by 5 (e.g., 20 variables should produce between 7 and 4 components with eigenvalues greater than 1" (p. 644)
  - **Step 6: Determine the number of factors using the Scree Test:** "A second criterion is the **Scree Test** … of eigenvalues plotted against factors" (p. 644)
    - "The eigenvalue is highest for the first factor and moderate but decreasing for the next few factors before teaching small values for the last several factors" (p. 644)
    - "Look for the point where **a line drawn through the points changes slope**" (p. 644)
  - **Step 7: Determine the number of variables that load on each factor by looking at the rotated loading matrix**: "Once you have determined the number of factors, it is important to look at the rotated loading matrix to determine the number of variables that load on each factor" (p. 646)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Procedures**: (cont'd)
  - "If only one variable loads highly on a factor, the factor is poorly defined" (p. 646)
  - "If two variables load on a factor, then whether or not it is reliable depends on the pattern of correlations of these variables with each other and with other variables in R. If the two variables are highly correlated with each other (say, $r > .70$) and relatively uncorrelated with other variables, the factor may be reliable" (p. 646)
  - "Interpretation of factors defined by only one or two variables is hazardous, however, under even the most exploratory factor analysis" (p. 646)
  - **Step 8: Determine which type of Rotation to use for final interpretation**: "The decision between orthogonal and oblique rotation is made as soon as the number of reliable factor is apparent" (p. 646)
    - "In many factor analytic situations, oblique rotation seems more reasonable on the face of it than orthogonal rotation because it seems more likely that factors are correlated than that they are not" (p. 646)
    - Reporting the results of Oblique Rotation requires reporting the elements of the Pattern Matrix and the factor correlation matrix"--which might be less simplistic than reporting orthogonal rotation (p. 646)
    - "If a goal of analysis is comparison of factor structure in groups, then orthogonal rotation has distinct advantages" (p. 646)
  - **Step 9: Run Oblique Rotation to check for correlations among factors**: "Request Oblique Rotation with the desired number of factors and look at the correlations among factors" (p. 646)
    - "Look at the factor correlation matrix for correlations around .32 or above. **If correlations [among factors] exceed .32, then there is 10% (or more) overlap in variance among factors, enough variance to warrant oblique rotation** unless there are compelling reasons for orthogonal rotation" (p. 646)
    - Choose Orthogonal Rotation if "a desire to compare structure in groups, a need for orthogonal factors in other analyses, or a theoretical need for orthogonal rotation" (p. 647)
  - **Step 10: Check if you have a simple structure**: "If simple structure is present (and factors are not too highly correlated), **several variables correlate highly with each factor and only one factor correlates highly with each variable**"

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Procedures**: (cont'd)
  - **Step 11: Check the importance of a factor or factors**: "The importance of a factor (or a set of factors) is evaluated by the **proportion of variance or covariance accounted for by the factor after rotation**. The proportion of variance attributable to individual factors differs before and after rotation because rotation tends to redistribute variance among factors somewhat" (p 647)
    - "After orthogonal rotation, the importance of a factor is related to the size of its SSLs… SSLs are converted to proportion of variance for a factor by dividing by *p*, the number of variables. SSLs are converted to proportion of covariance for a factor by dividing its SSL by the sum of SSLs or sum of communalities" (p. 648)
  - **Step 12: Check the internal consistency of the solution**: "An estimate of the **internal consistency of the solution**–the certainty with which factor axes are fixed in the variable space–**is given by the squared multiple correlations of factor scores predicted from scores on observed variables**" (p. 649)
    - "In a good solution, SMCs range between 0 to 1; **the larger the SMCs, the more stable the factors**"
    - "A high SMC (say, .70 or better) means that the **observed variables account for substantial variance in the factor scores**"
    - "A low SMC means that the factors are poorly defined by the observed variables.
    - "If an SMC is negative, too many factors have been retained"
    - "If an SMC is above 1, the entire solution needs to be reevaluated"
    - **SPSS: SMCs are shown in the diagonal of the covariance matrix for estimated regression factor scores**

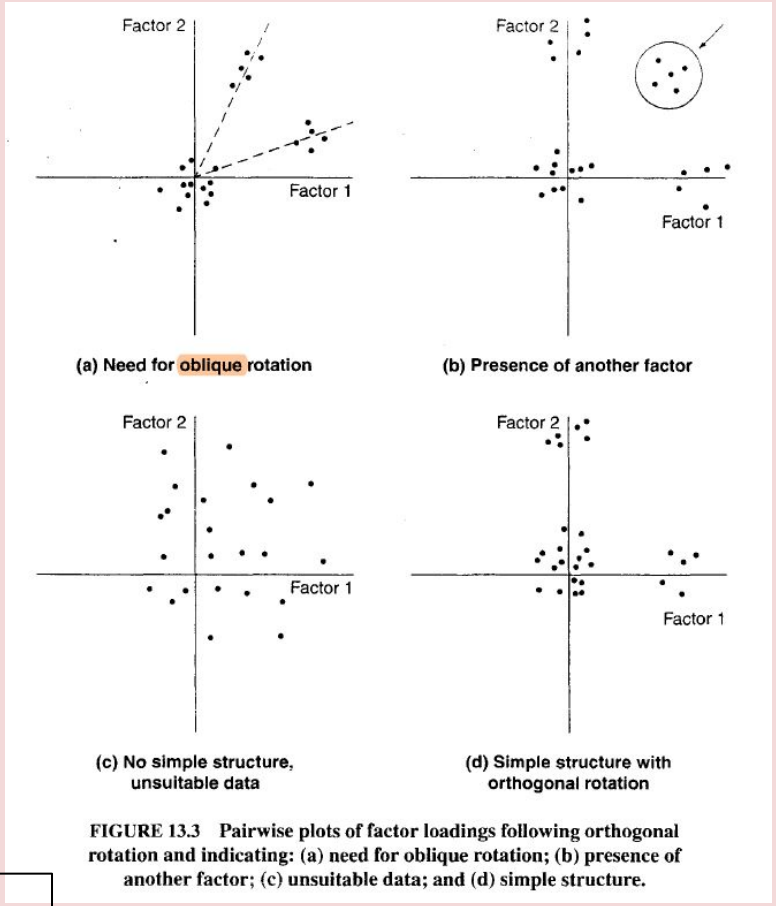


FIGURE 13.3 Pairwise plots of factor loadings following orthogonal rotation and indicating: (a) need for oblique rotation; (b) presence of another factor; (c) unsuitable data; and (d) simple structure.

On how to interpret a PCA output: https://stats.oarc.ucla.edu/spss/output/principal_components/

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Procedures**: (cont'd)
  - **Step 13: Interpret the factors by choosing a criterion for meaningful correlation, collects the variables with loadings larger than the criterion, and look for a concept that unifies them**: "The researcher decides on a criterion for meaningful correlation (usually. 32 or larger), collects together the variables with loadings in excess of the criterion, and searches for a concept that unifies them" (p. 649)
    - Sort variables by the size of loadings in the SPSS
    - Recall: "After **Orthogonal Rotation**, the values in the loading matrix are correlations between variables and factors" (p. 649)
    - Recall: "After **Oblique Rotation**, … the loading is not a correlation but a measure of the unique relationship between the factor and the variable"
      - "Because factors correlate, the correlations between variables and factors (available in **Structure Matrix**) are inflated by overlap between factors. A variable may correlate with one factor through its correlation with another factor rather than directly" (p. 649)
      - **Interpreting the Pattern Matrix may be more pragmatic, because the high and low loadings are more apparent**
    - Rules of thumb for variable selection:
      - "Only variables with loading of .32 and above are interpreted" (p. 649); "The greater the loading, the more the variable is a pure measure of the factor" (p. 649)
      - "Loading in excess of **.71** (50% overlapping variance) are considered excellent, **.63** (40% overlapping variance) very good, **.55** (30% overlapping variance) good, .**45** (20% overlapping variance) fair, and **.32** (10% overlapping variance) poor" (p. 649)

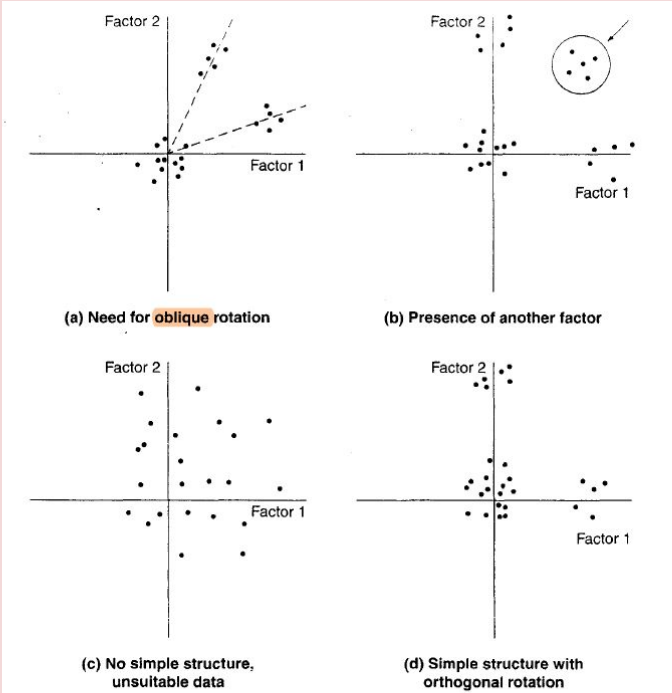


FIGURE 13.3 Pairwise plots of factor loadings following orthogonal rotation and indicating: (a) need for oblique rotation; (b) presence of another factor; (c) unsuitable data; and (d) simple structure.

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Procedures**: (cont'd)
  - "Choice of the cutoff for size of loading to be interpreted is a matter of research preference" (p. 649)
    - "Sometimes there is a gap in loadings across the factors and, if the cutoff is in the gap, it is easy to specify which variables load and which do not"
    - "Other times, the cutoff is selected because one can interpret factors with that cutoff but not with a lower cutoff" (p. 649)
  - Watch for Homogeneity of Scores in the Sample: "The size of the loadings is influenced by the homogeneity of scores in the sample. If homogeneity is suspected, interpretation of lower loadings is warranted. That is, **if the sample produces similar scores on observed variables, a lower cutoff is used for interpretation of factors**" (p. 649)
  - **Step 14: Assign a name or label to a factor**: "researcher usually tries to **characterize a factor** by assigning it a name or a label, a process that involves art as well as science" (p. 650)
    - "Interpretation of factors is facilitated by **output of the matrix of sorted loadings** where variables are grouped by their correlations with factors" (p. 650)
    - "The replicability, utility, and complexity of factors are also considered in interpretation"
      - "Is the solution replicable in time and/or with different groups?"
      - "Is it trivial or is it a useful addition to scientific thinking in a research area?"
      - "Where do the factors fit in the hierarchy of 'explanations' about a phenomenon?"
      - "Are they complex enough to be intriguing without being so complex that they are uninterpretable?" (p. 650)
- **Factor Scores** = "Factor scores are estimates of the scores that subjects would have received on each of the factors had they been measured directly"
  - "One could use PCA to **reduce a large number of DVs to a smaller number of components** for use as DVs in MANOVA" (p. 650)
  - "One could **reduce a large number of IVs to a small number of factors** for purposes of predicting a DV in multiple regression or group membership in a discriminant analysis or logistic regression"
  - "In the context of a theoretical FA, factor scores are estimates of values that would be produced if the underlying constructs could be measured directly" (p. 650)
  - "If factors are few in number, stable, and interpretable, their use enhances subsequent analyses"
  - "The simplest is to **sum scores on variables that load highly on each factor**" (p. 650)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- "Variables with bigger standard deviations contribute more heavily to the factor scores produced by this procedure, a problem that is alleviated if variable scores are standardized first or if the variables have roughly equal standard deviations to begin with" (p. 650)
- "There are several sophisticated statistical approaches to estimating factors. All produce factor scores that are correlated, but not perfectly, with the factors. The correlations between factors and factor scores are higher when communialities are higher and when the ratio of variables to factors is higher. But as long as communalities are estimated, factor scores suffer from indeterminacy because there is an infinite number of possible factor scores that all have the same mathematical characteristics. As long as factor scores are considered only estimates, however, the researcher is not overly beguiled by them" (p. 650)
- "The distribution of each factor's scores has a mean of zero and a standard deviation of 1 (after PCA) or equal to the SMC between factors and variables (after FA)" (p. 650)
- **Two methods of estimating factor scores:**
  - (a) Bartlett method: "factor scores correlate only with their own factors and the factor scores are unbiased (that is, neither systematically too close nor too far away from 'true' factor scores). The factor scores correlate with the factors almost as well as in the regression approach and have the same mean and standard deviation as in the regression approach. However, factor scores can still be correlated with each other" (p. 650)
  - (b) Anderson-Rubin approach: "**produces factor scores that are uncorrelated with each** other even if factors are correlated. Factor scores have been zero, standard deviation 1. Factor scores correlate with their own factors almost as well as in the regression approach, but they sometimes also correlate with other factors (in addition to the one they are estimating) and they are somewhat biased. If you need uncorrelated scores, the Anderson-Rubin approach is best; otherwise the regression approach is probably best simply because it is best understood and most widely available" (p. 651)

- **Comparisons among solutions and groups**
  - "Frequently, a researcher is interested in deciding whether or not two groups that differ in experience or characteristics **have the same factors.** Comparisons among factor solutions involve the ***pattern of the correlations*** between variables and factors, or ***both the pattern and magnitude of the correlations*** between them" (p. 651)

Notes on FA and PCA (Tabachnick & Fidell, 2007, ch. 13) (cont'd)

- **Step 15: Reporting the results** (p. 670ff): e.g.,:
  - **Principal factors extraction with varimax rotation** was performed through SPSS on [number of] items from [the name of scale] for a sample of [number and population type]
    - **Principal components extraction** was used prior to principal factors extraction to **estimate number of factors, presence of outliers, absence of multicollinearity, and factorability of the correlation matrices**
      - With an alpha = .001 cutoff level, [number] of [sample size and population type] produced scores that identified them as outliers; there cases were deleted from principal factors extraction
  - **[number of] factors were extracted**
    - As indicated by SMCs, **all factors were internally consistent and well defined by the variables**; the lowest of the SMCs for factors from variables was [.78 or another value]
      - The reverse was not true, however; variables were, by large, not well defined by this factor solution
      - Communality values tended to be low
    - With a cutoff of .45 [or another value] for inclusion of a variable in interpretation of a factor, **[number] of [total number of] variables did not load on any factor**
      - Failure of numerous variables to load on a factor reflects heterogeneity of items on the [scale]
      - However, only two of the variables in the solution, …, were complex
  - **When oblique rotation was requested**, factors interpreted as [Construct Names] correlated [.30. or another value]
    - However, because the correlation was modest and limited to one pair of factors, and because remaining correlations were low, **orthogonal rotation was chosen**
  - Loadings of variables on factors, communalities, and percents of variance and covariance are shown in Table [number]. Variables are ordered and grouped by size of loading to facilitate interpretation…. Loadings under .45 (20% of variance) are replaced by zeros
  - In sum, the [number] factors on the [scale] for this group of [sample] are [construct name] (e.g., …), [construct name] (e.g., …), …

TABLE 13.21 Checklist for Factor Analysis

1. Limitations
   a. Outliers among cases
   b. Sample size and missing data
   c. Factorability of **R**
   d. Normality and linearity of variables
   e. Multicollinearity and singularity
   f. Outliers among variables
2. Major analyses
   a. Number of factors
   b. Nature of factors
   c. Type of rotation
   d. Importance of factors
3. Additional analyses
   a. Factor scores
   b. Distinguishability and simplicity of factors
   c. Complexity of variables
   d. Internal consistency of factors
   e. Outlying cases among the factors

https://www.youtube.com/watch?v=g_3kaSnq-DY
How to Interpret a FA SPSS Output:
https://stats.oarc.ucla.edu/spss/output/factor-analysis/

Results (Research Questions Set 1: 1A-D)

Results of EFA on the 12 BM1 Items Measured at T1 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Varimax (Orthogonal)** Rotation on 2 Factors
- Certain SMCs (initial communalities) were not very large, while certain others were of acceptable sizes; the factors did not explain a large proportion of variance in BM1_1_4_UtilizingStakeholdersAsResources and BM1_1_5_DesignatedInfrastructure.
- The 2 Factors explained 34% of the variance in the variables, with Factor 1 explaining 21% and Factor 2 13% of the variance.

Communalities

	Initial	Extraction
BM1_1_1_StableCLDPolicy_Strategy	.355	.425
BM1_1_2_SLTBacking	.329	.323
BM1_1_3_ManpowerBudgetInfrastructure	.582	.504
BM1_1_4_UtilizingStakeholdersAsResources	.209	.181
BM1_1_5_DesignatedInfrastructure	.224	.192
BM1_2_6_RegularPolicyReview	.342	.337
BM1_2_7_AnnualUpdateOfActionPlan	.396	.329
BM1_3_8_VisibleCLDPolicyForStakeholders	.377	.287
BM1_3_9_AccessibleCommunicationChannels	.411	.414
BM1_3_10_AppropriateLanguageForStakeholders	.435	.400
BM1_3_11_RegularFeedbackCollection	.474	.445
BM1_3_12_FeedbackReviewInPlanning	.512	.288

Extraction Method: Principal Axis Factoring.

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Clear Policy & Strategy (BM1a)** (4 items: 1.1.3, 1.1.1, *1.3.10*, 1.2.6); **F2 Collection of Regular Feedback (BM1b)** (1 item; 1.3.11)

- The Rotated Factor Matrix shows the factor loadings of the variables on each of the 2 factors.
- Using .45 as the cutoff value for interpreting a factor, 2 items (BM1_1_5_DesignatedInfrastructure and BM1_1_4_UtilizingStakeholdersAsResources) did not load on any factor.
- 1 variable (BM1_3_9_AccessibleCommunicationChannels) was complex in this solution.
- Factor 1 describes **School's Clear CLD Education Policy and Strategy on Manpower, Budget, Infrastructure, Regular Review, Updated Plans, and SLT Backing**
- Factor 2 describes **School's Collecting and Reviewing Feedback on the CLD Education Policy and Plans by Making It Visible and Accessible to Stakeholders**

Rotated Factor Matrix[a]

	Factor 1	Factor 2
BM1_1_3_ManpowerBudgetInfrastructure	.710	
BM1_1_1_StableCLDPolicy_Strategy	.635	
BM1_3_10_AppropriateLanguageForStakeholders	.620	
BM1_2_6_RegularPolicyReview	.568	
BM1_2_7_AnnualUpdateOfActionPlan	.547	
BM1_1_2_SLTBacking	.515	
BM1_1_5_DesignatedInfrastructure	.423	
BM1_3_11_RegularFeedbackCollection		.667
BM1_3_8_VisibleCLDPolicyForStakeholders		.536
BM1_3_12_FeedbackReviewInPlanning		.536
BM1_3_9_AccessibleCommunicationChannels	.384	.516
BM1_1_4_UtilizingStakeholdersAsResources		.416

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 3 iterations.

Results of EFA on the 12 BM1 Items Measured at T2 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Varimax (Orthogonal)** Rotation on 2 Factors
- In general the SMCs were larger at T2 compared to those at T1.
- The factors did not explain a large proportion of variance in BM1_2_7_AnnualUpdateOfActionPlan.
- The 2 Factors explained 39% of the variance in the variables, with Factor 1 explaining 20% and Factor 2 19% of the variance.

Communalities

	Initial	Extraction
BM1_1_1_StableCLDPolicy_Strategy	.298	.318
BM1_1_2_SLTBacking	.391	.223
BM1_1_3_ManpowerBudgetInfrastructure	.552	.630
BM1_1_4_UtilizingStakeholdersAsResources	.470	.371
BM1_1_5_DesignatedInfrastructure	.482	.392
BM1_2_6_RegularPolicyReview	.454	.420
BM1_2_7_AnnualUpdateOfActionPlan	.479	.178
BM1_3_8_VisibleCLDPolicyForStakeholders	.556	.433
BM1_3_9_AccessibleCommunicationChannels	.498	.423
BM1_3_10_AppropriateLanguageForStakeholders	.495	.367
BM1_3_11_RegularFeedbackCollection	.645	.546
BM1_3_12_FeedbackReviewInPlanning	.602	.391

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Clear Policy, Infrastructure, & Strategy (BM1a*)** (4 items: 1.1.3, 1.2.6, *1.1.5*, 1.1.1); **F2 Collection & Review of Regular Feedback on Policy Made Clear to Stakeholders (BM1b*)** (3 items: 1.3.11, *1.3.8, 1.3.12*)

- The Rotated Factor Matrix shows the factor loadings of the variables on each of the 2 factors.
- Using .45 as the cutoff value for interpreting a factor, 1 item (BM1_2_7_AnnualUpdateOfActionPlan) did not load on any factor.
- 2 variables (BM1_3_9_AccessibleCommunicationChannels and BM1_3_10_AppropriateLanguageForStakeholders) was complex in this solution.
- Factor 1 describes **a Clear CLD Education Policy and Strategy on Manpower, Budget, Designated Infrastructure, Regular Review, and SLT Backing**
- Factor 2 describes **Collecting and Reviewing Feedback on the CLD Education Policy and Plans by Utilizing Stakeholders as Resources**

Rotated Factor Matrix[a]

	Factor 1	Factor 2
BM1_1_3_ManpowerBudgetInfrastructure	.792	
BM1_2_6_RegularPolicyReview	.642	
BM1_1_5_DesignatedInfrastructure	.600	
BM1_1_1_StableCLDPolicy_Strategy	.563	
BM1_1_2_SLTBacking	.454	
BM1_2_7_AnnualUpdateOfActionPlan	.385	
BM1_3_11_RegularFeedbackCollection		.739
BM1_3_8_VisibleCLDPolicyForStakeholders		.651
BM1_3_12_FeedbackReviewInPlanning		.625
BM1_1_4_UtilizingStakeholdersAsResources		.539
BM1_3_9_AccessibleCommunicationChannels	.414	.501
BM1_3_10_AppropriateLanguageForStakeholders	.343	.500

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Comparison Between the EFA Results of the T1 and T2 Measures of BM1 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--2 Orthogonal Factors

BM1a Clear Policy & Strategy (4 items)

- **1.1.3 Manpower, Budget, Infrastructure**: “Has your School assigned manpower, recurrent budget, and infrastructure to support the work on CLD education?” (.710)
- **1.1.1 Stable CLD Policy - Strategy**: “Is there a school policy on CLD with clear outline on the overarching strategy for program development and details of an action plan?” (.635)
- ***1.3.10 Appropriate Language & Format for Stakeholders****: “Does your school CLD policy and program present in either Chinese or English or both and in an appropriate format to match the communication needs of different stakeholders?” (.620)*
- **1.2.6 Regular Policy Review**: “Does your school review the policy at least every three years?” (.568)

BM1b Collection of Regular Feedback (1 item)

- **1.3.11 Regular Feedback Collection:** “Does your School regularly collect and consider views and feedback from the following stakeholders (students, parents, teachers, employers, community partners, university partners)?” (.667)

Measured at T2 (variables with loadings > .55 are interpreted)--2 Orthogonal Factors

BM1a* Clear Policy, Infrastructure, & Strategy (4 items)

- **1.1.3 Manpower, Budget, Infrastructure**: “Has your School assigned manpower, recurrent budget, and infrastructure to support the work on CLD education?” (.792)
- **1.2.6 Regular Policy Review**: “Does your school review the policy at least every three years?” (.642)
- ***1.2.5 Designated Infrastructure****: “Is there a designated infrastructure (e.g., resource room, an equivalent space or facilities) to facilitate the implementation of the CLD programs?” (.600)*
- **1.1.1 Stable CLD Policy - Strategy**: “Is there a school policy on CLD with clear outline on the overarching strategy for program development and details of an action plan?” (.563)

BM1b* Collection & Review of Feedback on Policy Made Clear to Stakeholders (3 items)

- **1.3.11 Regular Feedback Collection:** “Does your School regularly collect and consider views and feedback from the following stakeholders (students, parents, teachers, employers, community partners, university partners)?” (.739)
- ***1.3.8 Visible CLD Policy for Stakeholders****: “Does your School share CLD policy and current programs with all stakeholders (students, parents, teachers, employers, community partners, university partners)?” (.651)*
- ***1.3.12 Feedback Review in Planning****: “Is there evidence that stakeholder feedback has been reviewed and considered in relevant review and up-to-date action plan?” (.625)*

Results of EFA on the 17 BM2 Items Measured at T1 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .546)
- SMCs (initial communalities) were of acceptable sizes; the factors did not explain a large proportion of variance in BM2_2_7_ReceivedCLDInitialTraining, BM2_1_1a_Management_PowerpowerBudget, and BM2_3_8_InductionToNewMembers.
- The 2 Factors explained 40% of the variance in the variables, with Factor 1 explaining 32% and Factor 2 8% of the variance.

Communalities

	Initial	Extraction
BM2_1_1a_Leadership_PIE	.660	.535
BM2_1_1b_Leadership_LeadStakeholders	.548	.347
BM2_1_1c_Leadership_CommunicateWithSLT	.527	.321
BM2_1_1d_Leadership_TeamCompositionReview	.560	.529
BM2_1_2a_Management_ManpowerBudget	.428	.174
BM2_1_2b_Management_MonitorSupportTeachers	.590	.459
BM2_1_3a_Networking_MaintainExpandNetworks	.740	.631
BM2_1_3b_Networking_EstablishNewNetworks	.672	.449
BM2_1_4a_Coordination_FacilitateTaskCompletion	.645	.296
BM2_1_4b_Coordination_AdvocateWholeSchApproach	.532	.357
BM2_1_4c_Coordination_CommunicateWithStakeholders	.670	.513
BM2_2_5_CareerMaster_ReceiveCPDAnnually	.584	.587
BM2_2_6_CareerTeam_ReceiveCPDAnnually	.622	.653
BM2_2_7_ReceivedCLDInitialTraining	.558	.077
BM2_3_8_InductionToNewMembers	.508	.175
BM2_3_9_AnnualInternalSharing	.585	.437
BM2_3_10_AnnualExternalSharing	.478	.200

Extraction Method: Principal Axis Factoring.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 7 items out of the 17 items (BM2_3_10_AnnualExternalSharing, BM2_1_1c_Leadership_CommunicateWithSLT, BM2_1_1a_Leadership_PIE, BM2_3_9_AnnualInternalSharing, BM2_2_7_ReceivedCLDInitialTraining, BM2_1_1a_Management_PowerpowerBudget, and BM2_3_8_InductionToNewMembers) did not load on any factor.
- 2 variables (BM2_1_1a_Leadership_PIE and BM2_3_9_AnnualInternalSharing) were complex in this solution.
- Factor 1 describes **Teacher Leadership Competence in External Networking with Other Stakeholders and Internal Coordination with Other Teachers in Implementing CLD Education Policy and Plans**
- Factor 2 describes **Teacher Leadership Training Received by the Career Team Head Teacher and Team Members**

Pattern Matrix[a]

	Factor 1	Factor 2
BM2_1_3a_Networking_MaintainExpandNetworks	.848	
BM2_1_2b_Management_MonitorSupportTeachers	.730	
BM2_1_3b_Networking_EstablishNewNetworks	.690	
BM2_1_4a_Coordination_FacilitateTaskCompletion	.634	
BM2_1_1b_Leadership_LeadStakeholders	.597	
BM2_1_4c_Coordination_CommunicateWithStakeholders	.592	
BM2_1_1d_Leadership_TeamCompositionReview	.530	
BM2_1_4b_Coordination_AdvocateWholeSchApproach	.495	
BM2_3_10_AnnualExternalSharing	.412	
BM2_1_1c_Leadership_CommunicateWithSLT	.376	
BM2_2_6_CareerTeam_ReceiveCPDAnnually	-.307	.934
BM2_2_5_CareerMaster_ReceiveCPDAnnually		.797
BM2_1_1a_Leadership_PIE	.381	.450
BM2_3_9_AnnualInternalSharing	.305	.443
BM2_3_8_InductionToNewMembers		.358
BM2_2_7_ReceivedCLDInitialTraining		
BM2_1_2a_Management_ManpowerBudget		

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Teacher Leadership in CLD Programs Coordination (BM2a)** (6 items: *2.1.3a, 2.1.2b, 2.1.3b*, 2.1.4a, *2.1.1b, 2.1.4c*); **F2 Teacher Leadership Training (BM2b)** (2 items: *2.2.6, 2.2.5*)

Results of EFA on the 17 BM2 Items Measured at T2 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .672)
- SMCs (initial communalities) were of acceptable sizes; the factors did not explain a large proportion of variance in BM2_2_5_CareerMaster_ReceiveCPDAnnually and BM2_2_7_ReceivedCLDInitialTraining.
- The 2 Factors explained 41% of the variance in the variables, with Factor 1 explaining 35% and Factor 2 6% of the variance.

Communalities

	Initial	Extraction
BM2_1_1a_Leadership_PIE	.567	.458
BM2_1_1b_Leadership_LeadStakeholders	.711	.512
BM2_1_1c_Leadership_CommunicateWithSLT	.600	.363
BM2_1_1d_Leadership_TeamCompositionReview	.542	.367
BM2_1_2a_Management_ManpowerBudget	.540	.214
BM2_1_2b_Management_MonitorSupportTeachers	.681	.561
BM2_1_3a_Networking_MaintainExpandNetworks	.787	.617
BM2_1_3b_Networking_EstablishNewNetworks	.639	.475
BM2_1_4a_Coordination_FacilitateTaskCompletion	.681	.620
BM2_1_4b_Coordination_AdvocateWholeSchApproach	.493	.359
BM2_1_4c_Coordination_CommunicateWithStakeholders	.627	.492
BM2_2_5_CareerMaster_ReceiveCPDAnnually	.432	.105
BM2_2_6_CareerTeam_ReceiveCPDAnnually	.555	.342
BM2_2_7_ReceivedCLDInitialTraining	.385	.126
BM2_3_8_InductionToNewMembers	.669	.513
BM2_3_9_AnnualInternalSharing	.483	.461
BM2_3_10_AnnualExternalSharing	.534	.387

Extraction Method: Principal Axis Factoring.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 5 items out of the 17 items (BM2_2_7_ReceivedCLDInitialTraining, BM2_1_1a_Management_PowerpowerBudget, BM2_3_10_AnnualExternalSharing, BM2_1_3b_Networking_EstablishNewNetworks, and BM2_2_5_CareerMaster_ReceivedCPDAnnually) did not load on any factor.
- 2 variables (BM2_3_8_InductionToNewMembers and BM2_1_3b_Networking_EstablishNewNetworks) were complex in this solution.
- Factor 1 describes **Teacher Leadership Competence in Implementation of CLD Education Policy and Plans by Coordinating Team Members to Receive Training and Completing Tasks**
- Factor 2 describes **Teacher Leadership Competence in Supporting Teachers Toward Whole-School Approach and Leading Stakeholders and Maintaining/Expanding Networks**

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Teacher Leadership in CLD Programs Coordination/Implementation with Training (BM2a*)** (4 items: 2.1.4a, *2.1.1a*, *2.3.9*, *2.1.1c*); **F2 Teacher Leadership in Support Giving to Other Teachers and Collaboration with Stakeholders (BM2b*)** (3 items: *2.1.2b, 2.1.1b, 2.1.3a*).

Pattern Matrix[a]

	Factor 1	Factor 2
BM2_1_4a_Coordination_FacilitateTaskCompletion	.822	
BM2_1_1a_Leadership_PIE	.774	
BM2_3_9_AnnualInternalSharing	.733	
BM2_1_1c_Leadership_CommunicateWithSLT	.644	
BM2_1_1d_Leadership_TeamCompositionReview	.513	
BM2_2_6_CareerTeam_ReceiveCPDAnnually	.505	
BM2_3_8_InductionToNewMembers	.460	.320
BM2_2_7_ReceivedCLDInitialTraining	.331	
BM2_1_2a_Management_ManpowerBudget	.305	
BM2_1_2b_Management_MonitorSupportTeachers		.861
BM2_1_1b_Leadership_LeadStakeholders		.851
BM2_1_3a_Networking_MaintainExpandNetworks		.566
BM2_1_4c_Coordination_CommunicateWithStakeholders		.487
BM2_1_4b_Coordination_AdvocateWholeSchApproach		.471
BM2_3_10_AnnualExternalSharing		.442
BM2_1_3b_Networking_EstablishNewNetworks	.325	.428
BM2_2_5_CareerMaster_ReceiveCPDAnnually		.318

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser

Comparison Between the EFA Results of the T1 and T2 Measures of BM2 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--2 Oblique Factors

BM2a Teacher Leadership in CLD Programs Coordination Through Supporting Other Teachers & Networking with Stakeholders (6 items)

- ***2.1.3a Networking - Maintaining & Expanding Networks***: *"Is the Career Team able to demonstrate networking competence through … leading the maintenance and expansion of existing networks with different stakeholders (employers, university partners, community partners, parents, alumni)?" (.848)*
- ***2.1.2b Management - Monitoring & Supporting Teachers***: *"Is the Career Master/Mistress able to demonstrate management competence through … monitoring regularly and supporting career team members and non-career teachers (e.g., class teachers) on implementation and evaluation of the CLD plans/programs?" (.730)*
- ***2.1.3b Networking - Establishing New Networks***: *"Is the career master/mistress/Career Team able to demonstrate networking competence through … leading the establishment of new networks with different stakeholders?" (.690)*
- **2.1.4a Coordination - Facilitating Task Completion**: "Is the career master/mistress/Career Team able to demonstrate coordination competence through … communicating with different teams' members to facilitate task completion?" (.634)
- ***2.1.1b Leadership - Leading Stakeholders***: *"Is the career master/mistress/Career Team able to demonstrate leadership competence through … leading the internal and external stakeholders to develop the CLD plans/programs?" (.597)*
- ***2.1.4c Coordination - Communicating with Stakeholders***: *"Is the career master/mistress/Career Team able to demonstrate coordination competence through … communicating with employers, university partners, community partners, and alumni?" (.592)*

BM2b Teacher Leadership Training (2 items)

- ***2.2.6 Career Team - Receiving CPD Annually:*** *"Does your career master/mistress receive continuing professional development on core competencies in leadership, management, coordination, and networking once a year?" (.934)*
- ***2.2.5 Career Master - Receiving CPD Annually***: *"Have at least half of your Career Team members received initial training on career guidance and counseling (e.g., having completed the career guidance and education courses offered by CLAP@JC, Education Bureau, authorized tertiary institutions/organizations or equivalent courses, which have been recorded in EDB e-Services Portal and/or warded with a certificate?" (.979)*

Measured at T2 (variables with loadings > .55 are interpreted)--2 Oblique Factors

BM2a* Teacher Leadership in CLD Programs Coordination/Implementation with Sharing & SLT Communication (4 items)

- **2.1.4a Coordination - Facilitating Task Completion**: "Is the career master/mistress/Career Team able to demonstrate coordination competence through … communicating with different teams' members to facilitate task completion?" (.822)
- ***2.1.1a Leadership - Plan, Implement, Evaluate***: *"Is the career master/mistress/Career Team able to demonstrate leadership competence through … preparing, implementing, and evaluating CLD plans and programs?" (.774)*
- ***2.3.9 Annual Internal Sharing***: *"Does your School arrange annual sharing meeting for all staff to share good practices on CLD education and provide professional development opportunities for staff to enhance their career-related knowledge and competencies relating to their distributed leadership roles if appropriate?" (.733)*
- ***2.1.1c Leadership - Communicating with SLT***: *"Is the career master/mistress/Career Team able to demonstrate leadership competence through … leading/co-leading a committee by the career teacher to report continuously to and communicate with the senior management on CLD education, demonstrating alignments with the benchmarks?" (.644)*

BM2b* Teacher Leadership in Support Giving to Other Teachers & Networking with Stakeholders (3 items)

- ***2.1.2b Management - Monitoring & Supporting Teachers***: *"Is the Career Master/Mistress able to demonstrate management competence through … monitoring regularly and supporting career team members and non-career teachers (e.g., class teachers) on implementation and evaluation of the CLD plans/programs?" (.861)*
- ***2.1.1b Leadership - Leading Stakeholders***: *"Is the career master/mistress/Career Team able to demonstrate leadership competence through … leading the internal and external stakeholders to develop the CLD plans/programs?" (.851)*
- ***2.1.3a Networking - Maintaining & Expanding Networks***: *"Is the Career Team able to demonstrate networking competence through … leading the maintenance and expansion of existing networks with different stakeholders (employers, university partners, community partners, parents, alumni)?" (.566)*

Results of EFA on the 5 BM3 Items Measured at T1 (Mar 8, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were quite low; the factors did not explain a large proportion of variance in BM3_1_3_VisibleUptodateInformation.
- This one factor explains 28% of variance in the variables.

Communalities

	Initial	Extraction
BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo	.155	.209
BM3_1_2_TrainingForStudentSearchProcessInfo	.189	.291
BM3_1_3_VisibleUptodateInformation	.109	.135
BM3_2_4_ThreePossiblePathwaysByS6	.301	.545
BM3_2_5_ConfidentlyMakeInformedDecisionByS6	.190	.226

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 1 item (BM3_1_3_VisibleUptodateInformation) did not load on it.
- This Factor describes **Evidence of Students Identifying Multiple Career Pathways by F.6 Through Learning How to Search for Information**

Factor Matrix[a]

	Factor 1
BM3_2_4_ThreePossiblePathwaysByS6	.738
BM3_1_2_TrainingForStudentSearchProcessInfo	.540
BM3_2_5_ConfidentlyMakeInformedDecisionByS6	.476
BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo	.458
BM3_1_3_VisibleUptodateInformation	.367

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 11 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Evidence of Students' Identifying Multiple Career Pathways (BM3a)** (1 item: 3.2.4).

Results of EFA on the 5 BM3 Items Measured at T2 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .369, exceeding .32)
- SMCs (initial communalities) were not large; the factors did not explain a large proportion of variance in BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo.
- The 2 factors explains 47% of variance in the variables, with Factor 1 explaining 34% and Factor 2 13% of the variance.

Communalities

	Initial	Extraction
BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo	.138	.162
BM3_1_2_TrainingForStudentSearchProcessInfo	.322	.497
BM3_1_3_VisibleUptodateInformation	.251	.541
BM3_2_4_ThreePossiblePathwaysByS6	.324	.782
BM3_2_5_ConfidentlyMakeInformedDecisionByS6	.309	.378

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM3_1_2_TrainingForStudentSearchProcessInfo	.638
BM3_2_5_ConfidentlyMakeInformedDecisionByS6	.628
BM3_2_4_ThreePossiblePathwaysByS6	.588
BM3_1_3_VisibleUptodateInformation	.436
BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo	.425

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

- Using .45 as the cutoff value for interpreting a factor, 1 item (BM3_1_1_BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo) did not load on it.
- Factor 1 describes **Evidence of Students Identifying Multiple Career Pathways and Making Informed Decision by F.6**
- Factor 2 describes **School's Providence of Visible Up-to-date Information on Multiple Career Pathways and Training Students How to Search for It**

Pattern Matrix[a]

	Factor 1	Factor 2
BM3_2_4_ThreePossiblePathwaysByS6	.921	
BM3_2_5_ConfidentlyMakeInformedDecisionByS6	.547	
BM3_1_1_ProvideFullRangeOfMultiplePathwayInfo		
BM3_1_3_VisibleUptodateInformation		.763
BM3_1_2_TrainingForStudentSearchProcessInfo		.605

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

- On the left is a one-factor solution with PAF extraction method. The same three variables were clustered together like what we saw at T1.
- This one factor explained 30% of the variances in the variables.
- This factor describes **School's Training Students How to Search for Information to Identify Multiple Career Pathways**

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Training Students on Identifying Multiple Career Pathways (BM3a*)** (3 items: *3.1.2, 3.2.5,* 3.2.4).

Comparison Between the EFA Results of the T1 and T2 Measures of BM3 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--1 Factor

BM3a Evidence of Students' Identifying Multiple Career Pathways

- **3.2.4 Three Possible Pathways by S6**: "By Secondary 6 (Grade 12), more than 90% of students identify at least three possible pathways to pursue after graduation." (.738)

Measured at T2 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM3a* Training Students How to Identify Multiple Career Pathways

- ***3.1.2 Training for Students on Searching & Processing Information***: *"Does your school provide training for students on how to find and process up-to-date multiple pathways information to make informed choices for their future development?" (.638)*
- ***3.2.5 Confidently Making Informed Decision by S6***: *"By Secondary 6, more than 90% of students are confidently seeking multiple pathways information to inform their decision about further learning and/or work." (.628)*
- **3.2.4 Three Possible Pathways by S6**: "By Secondary 6 (Grade 12), more than 90% of students identify at least three possible pathways to pursue after graduation." (.588)

Results of EFA on the 7 BM4 Items Measured at T1 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with *r* = .321, exceeding .32)
- SMCs (initial communalities) were not large; the factors did not explain a large proportion of variance in BM4_1_1a_Programs_RaiseStudentAspirations.
- The 2 Factors explained 35% of the variance in the variables, with Factor 1 explaining 25% and Factor 2 10% of the variance.

Communalities

	Initial	Extraction
BM4_1_1a_Programs_RaiseStudentAspirations	.200	.146
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.231	.325
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.330	.419
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.286	.343
BM4_3_4_ToolsForBuildingUpStudentProfiles	.195	.671
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.282	.278
BM4_4_6_CollectMaintainAccurateDestinationData	.205	.274

Extr

Factor Matrix[a]

	Factor 1
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.595
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.589
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.564
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.524
BM4_1_1a_Programs_RaiseStudentAspirations	.387
BM4_4_6_CollectMaintainAccurateDestinationData	.327
BM4_3_4_ToolsForBuildingUpStudentProfiles	.313

Extraction Method: Principal Axis

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 3 items (BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest, BM4_4_5_CollectMaintainRecordsOnCLDExperiences, and BM4_1_1a_Programs_RaiseStudentAspirations) did not load on any factor.
- 1 variable (BM4_4_5_CollectMaintainRecordsOnCLDExperiences) was complex in this solution.
- Factor 1 describes **School's Career Programs Tailored to Meeting Diverse Student Needs by Collecting Accurate Students' Destination Data and Challenging Their Stereotypical Thinking**
- Factor 2 contains just one variable which may be unstable and is describing a unique variable: **Tools for Building up Student Profiles**

Pattern Matrix[a]

	Factor 1	Factor 2
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.645	
BM4_4_6_CollectMaintainAccurateDestinationData	.548	
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.536	
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.421	
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.341	.307
BM4_1_1a_Programs_RaiseStudentAspirations		
BM4_3_4_ToolsForBuildingUpStudentProfiles		.854

Extraction Method: Principal Axis Factoring.

Communalities

	Initial	Extraction
BM4_1_1a_Programs_RaiseStudentAspirations	.200	.150
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.231	.318
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.330	.347
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.286	.354
BM4_3_4_ToolsForBuildingUpStudentProfiles	.195	.098
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.282	.274
BM4_4_6_CollectMaintainAccurateDestinationData	.205	.107

Extraction Method: Principal Axis Factoring.

- The one-factor solution by PAF extraction method explained 24% of the variance in the variables. 3 variables (BM4_1_1a_Programs_RaiseStudentAspirations, BM4_4_6_CollectMaintainAccurateDestinationData, and BM4_3_4_ToolsForBuildingUpStudentProfiles) did not load on the factor (based on .45 as the cutoff value).
- This factor describes **School's Career Programs Involving Exploration Activities Tailored to Meeting Students' Diverse Needs and Identifying Their Interests by Challenging Their Stereotypical Thinking and Recording Their Experience**

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Diverse Career Exploration Activities to Identify Students' Interests/Needs & Challenge Stereotypical Views (BM4a)** (3 items: 4.3.3, 4.2.2, 4.1.1b).

Results of EFA on the 7 BM4 Items Measured at T2 (Mar 8, 2023)

- Final Solution: Principal Axis Factoring with **Varimax (Orthogonal)** Rotation on 2 Factors
- SMCs (initial communalities) were not large but mostly acceptable; both factors explained a proportional variance in the variables.
- The 2 Factors explained 53% of the variance in the variables, with Factor 1 explaining 40% and Factor 2 13% of the variance.

Communalities

	Initial	Extraction
BM4_1_1a_Programs_RaiseStudentAspirations	.464	.544
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.414	.447
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.446	.489
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.404	.429
BM4_3_4_ToolsForBuildingUpStudentProfiles	.628	.758
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.369	.384
BM4_4_6_CollectMaintainAccurateDestinationData	.196	.668

Extraction Method

Communalities

	Initial	Extraction
BM4_1_1a_Programs_RaiseStudentAspirations	.464	.453
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.414	.453
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.446	.495
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.404	.422
BM4_3_4_ToolsForBuildingUpStudentProfiles	.628	.765
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.369	.332
BM4_4_6_CollectMaintainAccurateDestinationData	.196	.056

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM4_3_4_ToolsForBuildingUpStudentProfiles	.874
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.704
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.673
BM4_1_1a_Programs_RaiseStudentAspirations	.673
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.650
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.576
BM4_4_6_CollectMaintainAccurateDestinationData	

Extraction Method: Principal Axis Factoring.

- The Rotated Factor Matrix shows the factor loadings of the variables on each of the 2 factors.
- Using .45 as the cutoff value for interpreting a factor, all the 7 variables loaded on at least factor.
- 1 variable (BM4_4_5_CollectMaintainRecordsOnCLDExperiences) was complex in this solution.
- Factor 1 describes **Career Tools for Building up Student Profiles and Exploration Programs Tailored to Meeting Diverse Student Needs by Raising Their Aspirations and Challenging Their Stereotypical Thinking**
- Factor 2 contains just one variable which may be unstable and is describing a unique variable: **Collecting and Maintaining Accurate Destination Data**

Rotated Factor Matrix[a]

	Factor 1	Factor 2
BM4_3_4_ToolsForBuildingUpStudentProfiles	.852	
BM4_1_1a_Programs_RaiseStudentAspirations	.735	
BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	.680	
BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	.650	
BM4_1_1b_Programs_ChallengeStereotypicalThinking	.643	
BM4_4_5_CollectMaintainRecordsOnCLDExperiences	.507	.356
BM4_4_6_CollectMaintainAccurateDestinationData		.814

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Use of Tools to Meet Students' Diverse Needs, Challenge Stereotypical Views, & Record Their Experience (BM4a*)** (6 items: *4.3.4*, 4.2.2, 4.1.1b, *4.1.1a*, 4.3.3, *4.4.5*).

- The one-factor solution by PAF extraction method explained 43% of the variance in the variables. 1 variable (BM4_4_6_CollectMaintainAccurateDestinationData) did not load on the factor (based on .45 as the cutoff value).
- This one factor describes **School's Career Tools for Building up Student Profiles and Exploration Programs Tailored to Meeting Diverse Student Needs by Raising Their Aspirations, Challenging Their Stereotypical Thinking, and Recording Their Experience**

Comparison Between the EFA Results of the T1 and T2 Measures of BM4 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM4a Diverse Career Exploration Activities to Identify Students' Needs & Challenge Stereotypical Views (3 items)

- **4.3.3 Exploration Activities to Identify Needs & Interest**: "Does your school provide career exploration activities (e.g., career assessment) for students to identify their needs, interests, and strengths for making informed choices?" (.595)
- **4.2.2 Career Provisions - Tailored to Each Student's Needs**: "Does your school develop careers provisions that include specific planning for groups of students requiring tailored support (e.g., students with special educational needs, "alternative path seekers"/"early school leavers")? (.589)
- **4.1.1b Programs - Challenging Stereotypical Thinking**: "The programs challenge stereotypical thinking (e.g., in terms of gender, religious or family background, ethnicity)." (.564)

Measured at T2 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM4a* Use of Tools to Meet Students' Diverse Needs, Challenge Their Stereotypical Views, & Record Their Experience (6 items)

- ***4.3.4 Tools for Building up Students' Profiles***: *"Does your school provide tools for students to reflect themselves (e.g., strengths, interests, CASK) and build up their individual profiles (e.g., CV360, student learning profiles), plan, and manage their own life development journey?" (.874)*
- **4.2.2 Career Provisions - Tailored to Each Student's Needs**: "Does your school develop careers provisions that include specific planning for groups of students requiring tailored support (e.g., students with special educational needs, "alternative path seekers"/"early school leavers")? (.704)
- **4.1.1b Programs - Challenging Stereotypical Thinking**: "The programs challenge stereotypical thinking (e.g., in terms of gender, religious or family background, ethnicity)." (.673)
- ***4.1.1a Programs - Raising Student Aspirations***: *"The Programs raise the aspirations (e.g., in terms of career direction, interest-development direction) of ALL Students." (.673)*
- **4.3.3 Exploration Activities to Identify Needs & Interest**: "Does your school provide career exploration activities (e.g., career assessment) for students to identify their needs, interests, and strengths for making informed choices?" (.650)
- ***4.4.5 Collecting & Maintaining Records on CLD Experiences***: *"Does your School collect and maintain accurate records on career and life development experiences of each student, and allow students to access to them for their career and life development?" (.576)*

Results of EFA on the 6 BM5 Items Measured at T1 (Mar 8, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were mostly acceptable; the factors did not explain a large proportion of variance in BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms and BM5_2_5_ExtendConnectionsWithAdultsPeers.
- This one factor explains 46% of variance in the variables.

Communalities

	Initial	Extraction
BM5_1_1_MechanismEngageStudentCocreation	.597	.585
BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	.639	.720
BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms	.192	.170
BM5_2_4_StudentCocreateOneCLDProgramAnnually	.574	.692
BM5_2_5_ExtendConnectionsWithAdultsPeers	.220	.174
BM5_2_6_DocumenteStudentIdeasCocreationPlans	.391	.446

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 2 items (BM5_2_5_ExtendConnectionsWithAdultsPeers and BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms) did not load on it.
- This Factor describes **Supportive Measures and Mechanisms to Facilitate Student Co-creation of CLD Program Annually**

Factor Matrix[a]

	Factor 1
BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	.849
BM5_2_4_StudentCocreateOneCLDProgramAnnually	.832
BM5_1_1_MechanismEngageStudentCocreation	.765
BM5_2_6_DocumenteStudentIdeasCocreationPlans	.668
BM5_2_5_ExtendConnectionsWithAdultsPeers	.417
BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms	.413

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Mechanisms to Facilitate Students' Co-creation of CLD Programs (BM5a)** (4 items: 5.1.2, 5.2.4, 5.1.1, 5.2.6).

Results of EFA on the 6 BM5 Items Measured at T2 (Mar 8, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were mostly acceptable; the factors did not explain a large proportion of variance in BM5_2_5_ExtendConnectionsWithAdultsPeers.
- This one factor explains 45% of variance in the variables.

Communalities

	Initial	Extraction
BM5_1_1_MechanismEngageStudentCocreation	.624	.673
BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	.565	.591
BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms	.368	.351
BM5_2_4_StudentCocreateOneCLDProgramAnnually	.515	.612
BM5_2_5_ExtendConnectionsWithAdultsPeers	.218	.150
BM5_2_6_DocumentStudentIdeasCocreationPlans	.320	.334

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 1 item (BM5_2_5_ExtendConnectionsWithAdultsPeers) did not load on it.
- This Factor describes **Supportive Measures and Mechanisms Through Documenting Students' Ideas and Plans to Facilitate Student Co-creation of CLD Program Annually**

Factor Matrix[a]

	Factor 1
BM5_1_1_MechanismEngageStudentCocreation	.820
BM5_2_4_StudentCocreateOneCLDProgramAnnually	.782
BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	.769
BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms	.593
BM5_2_6_DocumentStudentIdeasCocreationPlans	.578
BM5_2_5_ExtendConnectionsWithAdultsPeers	.388

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Mechanisms to Facilitate Students' Co-creation of CLD Programs (BM5a*)** (5 items: 5.1.1, 5.2.4, 5.1.2., *5.1.3*, 5.2.6).

Comparison Between the EFA Results of the T1 and T2 Measures of BM5 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--1 Factor

BM5a Mechanisms to Facilitate Students' Co-creation of CLD Programs (4 items)

- **5.1.2 Supportive Measures to Facilitate Students' Co-creation**: "Are there supportive measures to facilitate Students' participation in taking joint actions with school personnel, other adults, and peers on CLD practices in school?" (.849)
- **5.2.4 Student Co-creating One CLD Program Annually**: "Is there a channel for Students to inform the School of their wishes and needs to co-create programs (e.g., through developing communication channels, allocating human resources for following up and documenting students' ideas)?" (.832)
- **5.1.1 Mechanism to Engage Students in Co-creation**: "Is there a mechanism established to engage and facilitate Students' participation in planning, implementing, and evaluating the CLD programs and activities (e.g., having designated staff to hold regular co-planning meetings with and train up career prefects?" (.765)
- **5.2.6 Documenting Students' Ideas & Co-creation Plans**: "Is Each Student provided at least one opportunity to extend connections with adults (e.g., mentors in mentorship program) and peers to explore on CLD topics?" (.668)

Measured at T2 (variables with loadings > .55 are interpreted)--1 Factor

BM5a* Mechanisms to Facilitate Students' Co-creation of CLD Programs (5 items)

- **5.1.1 Mechanism to Engage Students in Co-creation**: "Is there a mechanism established to engage and facilitate Students' participation in planning, implementing, and evaluating the CLD programs and activities (e.g., having designated staff to hold regular co-planning meetings with and train up career prefects?" (.820)
- **5.2.4 Student Co-creating One CLD Program Annually**: "Is there a channel for Students to inform the School of their wishes and needs to co-create programs (e.g., through developing communication channels, allocating human resources for following up and documenting students' ideas)?" (.782)
- **5.1.2 Supportive Measures to Facilitate Students' Co-creation**: "Are there supportive measures to facilitate Students' participation in taking joint actions with school personnel, other adults, and peers on CLD practices in school?" (.769)
- ***5.1.3 Mechanism for Students to Give Views on CLD Programs**: "Is each student provided with opportunity to give their feedback/opinion on the planning of at least one activity related to CLD during their junior and senior forms?" (.593)*
- **5.2.6 Documenting Students' Ideas & Co-creation Plans**: "Is Each Student provided at least one opportunity to extend connections with adults (e.g., mentors in mentorship program) and peers to explore on CLD topics?" (.578)

Results of EFA on the 9 BM6 Items Measured at T1 (Mar 10, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .572)
- SMCs (initial communalities) were of acceptable sizes; the factors did not explain a large proportion of variance in BM6_1_1_PersGuidanceConductedByTrainedEducators.
- The 2 Factors explained 51% of the variance in the variables, with Factor 1 explaining 41% and Factor 2 10% of the variance.

Communalities

	Initial	Extraction
BM6_1_1_PersGuidanceConductedByTrainedEducators	.161	.169
BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3	.377	.485
BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6	.483	.469
BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps	.627	.614
BM6_2_5_AnnualReviewUpdateOfPersonalPlans	.576	.607
BM6_2_6_RecordKeepingSystem	.483	.383
BM6_3_7_EnrichStudentPersonalProfiles	.606	.713
BM6_3_8_ArticulateStudentVASK	.555	.637
BM6_3_9_ExtendStudentENOWExperience	.648	.514

Extraction Method: Principal Axis Factoring.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 3 items (BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps, BM6_1_1_PersGuidanceConductedByTrainedEducators, BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6) did not load on any factor.
- 1 variable (BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps) was complex in this solution.
- Factor 1 describes **Counseling Help Build Student Profiles and Articulate Their VASK**
- Factor 2 describes **Counseling Review Personal Plans Through a Record Keeping System**

Pattern Matrix[a]

	Factor 1	Factor 2
BM6_3_7_EnrichStudentPersonalProfiles	.889	
BM6_3_8_ArticulateStudentVASK	.888	
BM6_3_9_ExtendStudentENOWExperience	.538	
BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps	.448	.435
BM6_1_1_PersGuidanceConductedByTrainedEducators		
BM6_2_5_AnnualReviewUpdateOfPersonalPlans		.804
BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3		.783
BM6_2_6_RecordKeepingSystem		.600
BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6		.491

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Counseling Building Student Profiles and VASK (BM6a)** (2 items: 6.3.7, 6.3.8); **F2 Counseling Reviewing Personal Plans Through Records (BM6b)** (3 items: *6.2.5,* 6.1.2, *6.2.6*).

Results of EFA on the 9 BM6 Items Measured at T2 (Mar 10, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .537)
- SMCs (initial communalities) were of acceptable sizes; the factors did not explain a large proportion of variance in BM6_2_6_RecordKeepingSystem.
- The 2 Factors explained 50% of the variance in the variables, with Factor 1 explaining 40% and Factor 2 10% of the variance.

Communalities

	Initial	Extraction
BM6_1_1_PersGuidanceConductedByTrainedEducators	.323	.325
BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3	.501	.635
BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6	.570	.730
BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps	.484	.478
BM6_2_5_AnnualReviewUpdateOfPersonalPlans	.518	.523
BM6_2_6_RecordKeepingSystem	.291	.162
BM6_3_7_EnrichStudentPersonalProfiles	.595	.561
BM6_3_8_ArticulateStudentVASK	.571	.618
BM6_3_9_ExtendStudentENOWExperience	.499	.486

Extraction Method: Principal Axis Factoring.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 1 items (BM6_2_6_RecordKeepingSystem) did not load on any factor.
- No variable was complex in this solution.
- Factor 1 describes **Counseling Help Consolidate Students' VASK and ENOW Experience and Set Life's Goal Through Reviewing Plans**
- Factor 2 describes **Two Counseling Interviews Received by Students by S3 and S6**

Pattern Matrix[a]

	Factor 1	Factor 2
BM6_3_8_ArticulateStudentVASK	.862	
BM6_3_9_ExtendStudentENOWExperience	.750	
BM6_2_5_AnnualReviewUpdateOfPersonalPlans	.653	
BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps	.630	
BM6_3_7_EnrichStudentPersonalProfiles	.623	
BM6_1_1_PersGuidanceConductedByTrainedEducators	.482	
BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3		.857
BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6		.807
BM6_2_6_RecordKeepingSystem		

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

The two-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Counseling Consolidate Students' VASK and ENOW Experience and Set Life's Goal Through Reviewing Plans (BM6a*)** (5 items: 6.3.8, *6.3.9, 6.2.5, 6.2.4,* 6.3.7); **F2 Two Counseling Interviews Received by Students by S3 and S6 (BM6b*)** (2 items: 6.1.2, *6.1.3*).

Comparison Between the EFA Results of the T1 and T2 Measures of BM6 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--2 Oblique Factors

BM6a Counseling to Build Students' Profiles and VASK (2 items)

- **6.3.7 Enriching Students' Personal Profiles**: "To what extent does the 'personal guidance' enrich students' personal profiles?" (a) "through records on students' feedbacks or post-interview evaluation (e.g., questionnaires);" (b) "through students' artefacts or sharing;" (c) "through personal guidance interviewing guidelines;" and (d) "through related personal guidance tools, materials, or resource package" (.889)
- **6.3.8 Articulating Students' VASK**: "To what extent does the 'personal guidance' help students articulate their values, attitudes, skills, and knowledge (VASK)?" (.888)

BM6b Counseling to Review Students' Personal Plans through a Record Keeping System (3 items)

- ***6.2.5 Annual Review & Update of Personal Plans***: *"Do Students review and update their personal action plans with 'career advisor(s)' at least once per year?" (.804)*
- **6.1.2 Receiving One Personal Guidance Interview by S3**: "Does Each Student receive at least one individual personal guidance interview on the choice of educational and career pathways at the end of Secondary 3?" (.783)
- ***6.2.6 Record Keeping System***: *"Does your School establish a record keeping system that is accessible to both students and the 'advisors' for maintaining continuity of the students' progress on personal guidance throughout their Secondary years?" (.600)*

Measured at T2 (variables with loadings > .55 are interpreted)--2 Oblique Factors

BM6a* Counseling to Consolidate Students' VASK & ENOW Experience and Set Life's Goals through Reviewing Plans (5 items)

- **6.3.8 Articulating Students' VASK**: "To what extent does the 'personal guidance' help students articulate their values, attitudes, skills, and knowledge (VASK)?" (.862)
- ***6.3.9 Extending Students' ENOW Experience***: *"To what extent does the 'personal guidance' help students connect their personal profiles to further development and extend students' understanding of work experience (ENOW; expanded notion of work), which will enable students to make informed choices?" (.750)*
- ***6.2.5 Annual Review & Update of Personal Plans***: *"Do Students review and update their personal action plans with 'career advisor(s)' at least once per year?" (.653)*
- ***6.2.4 Identified Personal Life Goals & Roadmaps***: *"Are personal life goals and career roadmaps identified and co-created during personal guidance sessions?" (.630)*
- **6.3.7 Enriching Students' Personal Profiles**: "To what extent does the 'personal guidance' enrich students' personal profiles?" (a) "through records on students' feedbacks or post-interview evaluation (e.g., questionnaires);" (b) "through students' artefacts or sharing;" (c) "through personal guidance interviewing guidelines;" and (d) "through related personal guidance tools, materials, or resource package" (.623)

BM6b* Two Counseling Interviews Received by Students by S3 and S6 (2 items)

- **6.1.2 Receiving One Personal Guidance Interview by S3**: "Does Each Student receive at least one individual personal guidance interview on the choice of educational and career pathways at the end of Secondary 3?" (.857)
- ***6.1.3 Receiving One Personal Guidance Interview by S6***: *"Does each student receive at least one individual personal guidance interview on the choice of educational and career pathways at the end of Secondary 6?" (.807)*

Results of EFA on the 5 BM7 Items Measured at T1 (Mar 9, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .399, exceeding .32)
- SMCs (initial communalities) were mostly acceptable but with one very low value; the factors did not explain a large proportion of variance in BM7_2_3_SubjectEmbeddedCLD.
- The 2 Factors explained 47% of the variance in the variables, with Factor 1 explaining 34% and Factor 2 13% of the variance.

Communalities

	Initial	Extraction
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.459	.664
BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	.410	.531
BM7_1_2_TimeAllocationTrainedTeachers	.291	.740
BM7_2_3_SubjectEmbeddedCLD	.090	.066
BM7_3_4_CLDInOLEExtracurricularLearningExp	.210	.349

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.882
BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	.719
BM7_1_2_TimeAllocationTrainedTeachers	.434
BM7_3_4_CLDInOLEExtracurricularLearningExp	
BM7_2_3_SubjectEmbeddedCLD	

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 18

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 1 item (BM7_2_3_SubjectEmbeddedCLD) did not load on it.
- 2 variables (BM7_1_1a_CLDConceptsInHolisticCurriculumDesign and BM7_1_1b_StandAloneCLDCurriculumTimetabledProg) were complex in this solution.
- Factor 1 describes **School's Allocation of Time and Trained Teachers for CLD Curriculum Delivery**
  Factor 2 describes **School's Organizing CLD-Related Other-Learning-Experiences to Students**

Pattern Matrix[a]

	Factor 1	Factor 2
BM7_1_2_TimeAllocationTrainedTeachers	.936	-.313
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.491	.483
BM7_2_3_SubjectEmbeddedCLD		
BM7_3_4_CLDInOLEExtracurricularLearningExp		.641
BM7_1_1b_StandAloneCLDCurriculumTimetabled	.367	.500

ion Method: Principal Axis Factoring.
on Method: Promax with Kaiser

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 CLD Curriculum (BM7a)** (2 items: 7.1.1a, 7.1.1b).

- A one-factor solution was tested. 1 variable (BM7_2_3_SubjectEmbeddedCLD) had very low SMC; the factor did not explain a large proportion in BM7_1_2_TimeAllocationTrainedTeachers, BM7_3_4_CLDInOLEExtracurricularLearningExp, and BM7_2_3_SubjectEmbeddedCLD.
- This one factor (explaining 30% of the variances in the variables) describes **School's CLD Curriculum Implemented through Stand-Alone or Timetabled Programs**

Communalities

	Initial	Extraction
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.459	.778
BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	.410	.516
BM7_1_2_TimeAllocationTrainedTeachers	.291	.188
BM7_2_3_SubjectEmbeddedCLD	.090	.061
BM7_3_4_CLDInOLEExtracurricularLearningExp	.210	.083

Extraction Method: Principal Axis Factoring.

Results of EFA on the 5 BM7 Items Measured at T2 (Mar 9, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were mostly acceptable except for 2 variables; the factors did not explain a large proportion of variance in BM7_2_3_SubjectEmbeddedCLD and BM7_3_4_CLDInOLEExtracurricularLearningExp.
- This one factor explains 42% of variance in the variables.

Communalities

	Initial	Extraction
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.494	.618
BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	.503	.623
BM7_1_2_TimeAllocationTrainedTeachers	.496	.582
BM7_2_3_SubjectEmbeddedCLD	.166	.116
BM7_3_4_CLDInOLEExtracurricularLearningExp	.173	.179

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 2 items (BM7_2_3_SubjectEmbeddedCLD and BM7_3_4_CLDInOLEExtracurricularLearningExp) did not load on it.
- This Factor describes **CLD Curriculum Implemented Through Stand-Alone or Timetabled Programs and Allocation of Time and Trained Teachers**

Factor Matrix[a]

	Factor 1
BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	.789
BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	.786
BM7_1_2_TimeAllocationTrainedTeachers	.763
BM7_3_4_CLDInOLEExtracurricularLearningExp	.424
BM7_2_3_SubjectEmbeddedCLD	.340

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 CLD Curriculum by Trained Teachers (BM7a*)** (3 items: 7.1.1b, 7.1.1a, *7.1.2*).

Comparison Between the EFA Results of the T1 and T2 Measures of BM7 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM7a CLD Curriculum (2 items)

- **7.1.1a CLD Concepts in Holistic Curriculum Design**: “To what extent are the CLD concepts and practices incorporated in the School’s curriculum design (e.g., school annual CLD program plan with indication of CLD concepts/elements embedded in the school’s curriculum design)?” (.882)
- **7.1.1b Stand-Alone CLD Curriculum or Timetabled Programs**: “Has your School developed a stand-alone CLD curriculum or timetabled programs (e.g., as part of the Life Education/Positive Education lessons, units of Class Teacher Lessons) for students of different grade levels?” (.719)

Measured at T2 (variables with loadings > .55 are interpreted)--1 Factor

BM7a* CLD Curriculum by Trained Teachers (3 items)

- **7.1.1b Stand-Alone CLD Curriculum or Timetabled Programs**: “Has your School developed a stand-alone CLD curriculum or timetabled programs (e.g., as part of the Life Education/Positive Education lessons, units of Class Teacher Lessons) for students of different grade levels?” (.789)
- **7.1.1a CLD Concepts in Holistic Curriculum Design**: “To what extent are the CLD concepts and practices incorporated in the School’s curriculum design (e.g., school annual CLD program plan with indication of CLD concepts/elements embedded in the school’s curriculum design)?” (.786)
- ***7.1.2 Time Allocation & Trained Teachers***: *“Has your School developed a stand-alone CLD curriculum or timetabled programs (e.g., as part of the Life Education/Positive Education lessons, units of Class Teacher Lessons) for students of different grade levels?” (.763)*

Results of EFA on the 7 BM8 Items Measured at T1 (Mar 9, 2023)

- Final Solution: Principal Components with **Promax (Oblique)** Rotation on 2 Correlated Factors (with *r* = .415, exceeding .32).
- 1 variable (BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv) was severely right-skewed, causing Principal Axis Factoring extraction to be terminated.
- The 2 Factors explained 65% of the variance in the variables, with Factor 1 explaining 48% and Factor 2 17% of the variance.

Communalities

	Initial	Extraction
BM8_1_1_L1_ObservationalActivities	1.000	.561
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	1.000	.638
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	1.000	.704
BM8_1_4_WorkplaceLearningExpInSeniorForms	1.000	.805
BM8_1_5_DebriefFollowupWithStudents	1.000	.537
BM8_2_6_StudentInteractEmployersEmployeesByS6	1.000	.498
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	1.000	.795

Extraction M

Communalities

	Initial	Extraction
BM8_1_1_L1_ObservationalActivities	.378	.381
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.551	.534
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	.337	.142
BM8_1_4_WorkplaceLearningExpInSeniorForms	.529	.318
BM8_1_5_DebriefFollowupWithStudents	.520	.447
BM8_2_6_StudentInteractEmployersEmployeesByS6	.476	.404
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.669	.536

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.732
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.731
BM8_1_5_DebriefFollowupWithStudents	.669
BM8_2_6_StudentInteractEmployersEmployeesByS6	.636
BM8_1_1_L1_ObservationalActivities	.617
BM8_1_4_WorkplaceLearningExpInSeniorForms	.564
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	.377

Extraction Method: Principal Axis

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, all variables have loaded on a factor.
- 2 variables (BM8_2_6_StudentInteractEmployersEmployeesByS6 and BM8_1_5_DebriefFollowupWithStudents) were complex in this solution.
- Factor 1 describes **Organization of Workplace Learning for Senior Students through 1 L1 Observational Activity and 1 L2 Job Shadowing (Understanding Workplace Roles)**
- Factor 2 describes **Organization of L3 Authentic Workplace Experience to Students and Debriefing Them Toward Gaining Self-Knowledge with Tools**

Pattern Matrix[a]

	Component 1	Component 2
BM8_1_4_WorkplaceLearningExpInSeniorForms	.983	-.330
BM8_1_1_L1_ObservationalActivities	.736	
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.712	
BM8_2_6_StudentInteractEmployersEmployeesByS6	.467	.369
BM8_1_5_DebriefFollowupWithStudents	.462	.408
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv		.913
BM8_2_7_ToolsDebriefStudentInteractiveEncounters		.796

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Debriefing Tools and Workplace Learning for Senior Students (BM8a)** (6 items: 8.2.7, 8.1.2, *8.1.5*, 8.2.6, 8.1.1, 8.1.4).

- The one-factor solution by PAF extraction method explained 39% of the variance in the variables. 1 variable (BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv) did not load on the factor (based on .45 as the cutoff value).
- This one factor describes **Organizing Debriefing Tools and Workplace Learning for Senior Students to Interact with Employers/Employees through 1 L1 Observational Activity and 1 L2 Job Shadowing (Understanding Workplace Roles) Toward Gaining Self-Knowledge with Tools**

Results of EFA on the 7 BM8 Items Measured at T2 (Mar 9, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with r = .535, exceeding .32).
- The factors did explain a large of proportion of variance in the variables.
- The 2 Factors explained 45% of the variance in the variables, with Factor 1 explaining 36% and Factor 2 8% of the variance.

Communalities

	Initial	Extraction
BM8_1_1_L1_ObservationalActivities	.415	.545
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.324	.377
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	.204	.421
BM8_1_4_WorkplaceLearningExpInSeniorForms	.429	.443
BM8_1_5_DebriefFollowupWithStudents	.275	.322
BM8_2_6_StudentInteractEmployersEmployeesByS6	.382	.548
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.456	.464

Extraction Me

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, all variables have loaded on a factor.
- No variables was complex in this solution.
- Factor 1 describes **Organization of Workplace Learning for Senior Students through 1 L1 Observational Activity and 1 L2 Job Shadowing (Understanding Workplace Roles) and Debriefing Them Toward Gaining Self-Knowledge with Tools**
- Factor 2 describes **Organization of L3 Authentic Workplace Experience to Students Toward Interacting with Employers/Employees**

Pattern Matrix[a]

	Factor 1	Factor 2
BM8_1_1_L1_ObservationalActivities	.815	
BM8_1_4_WorkplaceLearningExpInSeniorForms	.626	
BM8_1_5_DebriefFollowupWithStudents	.610	
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.598	
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.538	
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv		.729
BM8_2_6_StudentInteractEmployersEmployeesByS6		.584

Communalities

	Initial	Extraction
BM8_1_1_L1_ObservationalActivities	.415	.430
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.324	.375
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	.204	.088
BM8_1_4_WorkplaceLearningExpInSeniorForms	.429	.446
BM8_1_5_DebriefFollowupWithStudents	.275	.284
BM8_2_6_StudentInteractEmployersEmployeesByS6	.382	.370
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.456	.476

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM8_2_7_ToolsDebriefStudentInteractiveEncounters	.690
BM8_1_4_WorkplaceLearningExpInSeniorForms	.668
BM8_1_1_L1_ObservationalActivities	.656
BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	.612
BM8_2_6_StudentInteractEmployersEmployeesByS6	.609
BM8_1_5_DebriefFollowupWithStudents	.532
BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv	

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 4 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Debriefing Tools and Workplace Learning for Senior Students (BM8a*)** (5 items: 8.2.7, 8.1.4, 8.1.1, 8.1.2, 8.2.6).

- A one-factor solution by Principal Axis Factoring extraction method revealed that this one factor did not explain a large proportion of variance in BM8_1_3_L3_ActivitiesWorkplaceContextsAuthenticEnv; it did not load on the factor (based on .3 as the cutoff value).
- This one factor describes **Debriefing Tools and Workplace Learning for Senior Students to Interact with Employers/Employees through 1 L1 Observational Activity and 1 L2 Job Shadowing (Understanding Workplace Roles) Toward Gaining Self-Knowledge with Tools**

Comparison Between the EFA Results of the T1 and T2 Measures of BM8 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--1 Factor

BM8a Debriefing Tools and Workplace Learning for Senior Students (6 items)

- **8.2.7 Tools to Debrief Students on the Interactive Encounters**: "Are there tools to 'debrief' Students after the encounters to facilitate reflection and learning (e.g., CLAP CV360, student learning profile (SLP), exercises, and sharing opportunities in the classroom)?" (.732)
- **8.1.2 L2 Experiential Experiences to Understand Workplace Roles**: "[Level 2] Does your School offer workplace learning experience for Students that allow them to understand and participate in different workplace roles and activities (e.g., job tasting, job shadowing)? ___% of students participated" (.731)
- ***8.1.5 Debriefing or Follow-up with Students**: "Does your School debrief or follow-up with Students to relate each workplace learning experience to Students' personal career and life goals or action plans?" (.669)*
- **8.2.6 Student Participation (Interactions with Employers/Employees) by S6**: "By Secondary 6 (Grade 12), have more than 90% of students participated in such opportunities?" (.636)
- **8.1.1 L1 Observational Activities**: "[Level 1] Does your school offer workplace learning experience for students focusing on observing the actual work environment and the job roles, such as company tours (e.g., visit a tech company), site visits (e.g., airport), and employees' sharing? ___% of students participated" (.617)
- **8.1.4 Workplace Learning Experience in Senior Forms**: "Have more than 90% of students received opportunities to taste at least twice (one Level 1 and one Level 2 or Level 3 experiences) of workplace learning experiences in their senior grade levels?" (.564)

Measured at T2 (variables with loadings > .55 are interpreted)--1 Factor

BM8a* Debriefing Tools and Workplace Learning for Senior Students (5 items)

- **8.2.7 Tools to Debrief Students on the Interactive Encounters**: "Are there tools to 'debrief' Students after the encounters to facilitate reflection and learning (e.g., CLAP CV360, student learning profile (SLP), exercises, and sharing opportunities in the classroom)?" (.690)
- **8.1.4 Workplace Learning Experience in Senior Forms**: "Have more than 90% of students received opportunities to taste at least twice (one Level 1 and one Level 2 or Level 3 experiences) of workplace learning experiences in their senior grade levels?" (.668)
- **8.1.1 L1 Observational Activities**: "[Level 1] Does your school offer workplace learning experience for students focusing on observing the actual work environment and the job roles, such as company tours (e.g., visit a tech company), site visits (e.g., airport), and employees' sharing? ___% of students participated" (.656)
- **8.1.2 L2 Experiential Experiences to Understand Workplace Roles**: "[Level 2] Does your School offer workplace learning experience for Students that allow them to understand and participate in different workplace roles and activities (e.g., job tasting, job shadowing)? ___% of students participated" (.612)
- **8.2.6 Student Participation (Interactions with Employers/Employees) by S6**: "By Secondary 6 (Grade 12), have more than 90% of students participated in such opportunities?" (.609)

Results of EFA on the 4 BM9 Items Measured at T1 (Mar 9, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were not large but acceptable.
- This one factor explains 32% of variance in the variables.

Communalities

	Initial	Extraction
BM9_1_1_ProgramOnFurtherHigherEducation	.303	.367
BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6	.278	.353
BM9_2_3_TwoInteractionOpportunitiesByS6	.235	.239
BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	.270	.338

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, all variables loaded on this one factor.
- This Factor describes **School's Organizing Programs on FE and HE for Senior Students and Engaging Them in 2 Annual Visits and Guidance Toward Linking Their Experience to Setting Goals**

Factor Matrix[a]

	Factor 1
BM9_1_1_ProgramOnFurtherHigherEducation	.606
BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6	.594
BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	.582
BM9_2_3_TwoInteractionOpportunitiesByS6	.489

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 FE/HE Programs for Senior Students (BM9a)** (3 items: 9.1.1, *9.1.2,* 9.2.4).

Results of EFA on the 4 BM9 Items Measured at T2 (Mar 9, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were not large; the factor did not explain a large proportion of variance in BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6.
- This one factor explains 32% of variance in the variables.

Communalities

	Initial	Extraction
BM9_1_1_ProgramOnFurtherHigherEducation	.217	.334
BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6	.142	.200
BM9_2_3_TwoInteractionOpportunitiesByS6	.215	.363
BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	.227	.387

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 1 variable (BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6) was barely loaded on this factor.
- This Factor describes **School's Organizing Programs on FE and HE for Senior Students and Engaging Them in 2 Annual Visits and Providing Guidance for Them to Link Their Interaction and Experience to Setting Goals**

Factor Matrix[a]

	Factor 1
BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	.622
BM9_2_3_TwoInteractionOpportunitiesByS6	.602
BM9_1_1_ProgramOnFurtherHigherEducation	.578
BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6	.447

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 7 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 FE/HE Programs with 2 Interaction Opportunities for Senior Students (BM9a*)** (3 items: 9.2.4, *9.2.3,* 9.1.1).

Comparison Between the EFA Results of the T1 and T2 Measures of BM9 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM9a FE/HE Programs for Senior Students (3 items)

- **9.1.1 Program on Further/Higher Education**: “Does your School inform, encourage, and guide students to get access to the latest information related to further and higher education through a career guidance program fitted for this objective (e.g., life planning lessons/activities, expos, university fair)?” (.606)
- ***9.1.2 Two Meaningful Visits/Tours Annually by S6****: “By Secondary 6 (Grade 12), has each student experienced at least two meaningful visits or tours each year in the senior grade levels?” (.594)*
- **9.2.4 Guidance on Linking Interactions with CLD Goal Setting**: “Does your school guide students to link these direct interaction opportunities to their reflection of personal CLD or goals (e.g., through reflective journals of SLP)?” (.582)

Measured at T2 (variables with loadings > .55 are interpreted)--1 Factor

BM9a* FE/HE Programs with Two Interaction Opportunities for Senior Students (3 items)

- **9.2.4 Guidance on Linking Interactions with CLD Goal Setting**: “Does your school guide students to link these direct interaction opportunities to their reflection of personal CLD or goals (e.g., through reflective journals of SLP)?” (.622)
- ***9.2.3 Two Interaction Opportunities by S6****: “By Secondary 6 (Grade 12), does each student have at least two interaction opportunities offered in their senior forms with staff members or student representatives of further and higher education institutions?” (.602)*
- **9.1.1 Program on Further/Higher Education**: “Does your School inform, encourage, and guide students to get access to the latest information related to further and higher education through a career guidance program fitted for this objective (e.g., life planning lessons/activities, expos, university fair)?” (.578)

Results of EFA on the 6 BM10 Items Measured at T1 (Mar 9, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 2 Correlated Factors (with *r* = .519, exceeding .32).
- SMCs (initial communalities) were acceptable; the factors did explain a large of proportion of variance in the variables.
- The 2 Factors explained 56% of the variance in the variables, with Factor 1 explaining 45% and Factor 2 11% of the variance.

Communalities

	Initial	Extraction
BM10_1_1_StaffCoordinateParentEngagement	.316	.360
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.503	.616
BM10_1_3_GuidingValuesInParentEngagement	.484	.570
BM10_2_4_ProvideMultiplePathwayInfoToParents	.358	.581
BM10_2_5_GuideParentsToAccessPathwayResources	.291	.495
BM10_2_6_EngageParentsSupportPathwayProgram	.567	.720

Extraction M

Communalities

	Initial	Extraction
BM10_1_1_StaffCoordinateParentEngagement	.316	.342
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.503	.585
BM10_1_3_GuidingValuesInParentEngagement	.484	.559
BM10_2_4_ProvideMultiplePathwayInfoToParents	.358	.263
BM10_2_5_GuideParentsToAccessPathwayResources	.291	.164
BM10_2_6_EngageParentsSupportPathwayProgram	.567	.696

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
BM10_2_6_EngageParentsSupportPathwayProgram	.834
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.765
BM10_1_3_GuidingValuesInParentEngagement	.748
BM10_1_1_StaffCoordinateParentEngagement	.585
BM10_2_4_ProvideMultiplePathwayInfoToParents	.513
BM10_2_5_GuideParentsToAccessPathwayResources	.405

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 7 iterations required.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, all variables have loaded on a factor.
- No variables was complex in this solution.
- Factor 1 describes **Engaging Parents to Support Programs on Multiple Career Pathways Through the Adoption of the Guiding Values for Parents and the Coordination of Designated Staff**
- Factor 2 describes **School's Providing Parents with Multiple Career Pathways Information and Resources**

Pattern Matrix[a]

	Factor 1	Factor 2
BM10_2_6_EngageParentsSupportPathwayProgram	.840	
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.791	
BM10_1_3_GuidingValuesInParentEngagement	.743	
BM10_1_1_StaffCoordinateParentEngagement	.612	
BM10_2_5_GuideParentsToAccessPathwayResources		.733
BM10_2_4_ProvideMultiplePathwayInfoToParents		.726

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Engaging Parents to Support Multiple Career Pathways Programs (BM10a)** (4 items: 10.2.6, 10.1.2, 10.1.3, *10.1.1*).

- A one-factor solution by Principal Axis Factoring extraction method revealed that this one factor did not explain a large proportion of variance in BM10_2_5_GuideParentsToAccessPathwayResources; it did not load on the factor (using .45 as the cutoff value).
- This one factor describes **Engaging Parents to Support Programs on Multiple Career Pathways Through the Adoption of the Guiding Values for Parents, the Coordination of Designated Staff, and the Provision of Relevant Information**

Results of EFA on the 6 BM10 Items Measured at T2 (Mar 9, 2023)

- There was just one factor extracted in the solution.
- SMCs (initial communalities) were acceptable except for 1 variable; the factor did not explain a large proportion of variance in BM10_1_1_StaffCoordinateParentEngagement.
- This one factor explains 41% of variance in the variables.

Communalities

	Initial	Extraction
BM10_1_1_StaffCoordinateParentEngagement	.197	.131
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.569	.659
BM10_1_3_GuidingValuesInParentEngagement	.429	.484
BM10_2_4_ProvideMultiplePathwayInfoToParents	.369	.401
BM10_2_5_GuideParentsToAccessPathwayResources	.284	.229
BM10_2_6_EngageParentsSupportPathwayProgram	.500	.556

Extraction Method: Principal Axis Factoring.

- Using .45 as the cutoff value for interpreting a factor, 1 variable (BM10_1_1_StaffCoordinateParentEngagement) did not load on the factor.
- This one Factor describes **School's Engaging Parents to Support Programs on Multiple Career Pathways Through the Adoption of the Guiding Values for Parents and the Provision of Relevant Information**

Factor Matrix[a]

	Factor 1
BM10_1_2_DocumentationPromoteCLDThruParentEngage	.812
BM10_2_6_EngageParentsSupportPathwayProgram	.746
BM10_1_3_GuidingValuesInParentEngagement	.696
BM10_2_4_ProvideMultiplePathwayInfoToParents	.634
BM10_2_5_GuideParentsToAccessPathwayResources	.478
BM10_1_1_StaffCoordinateParentEngagement	.362

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 6 iterations required.

The one-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Engaging Parents to Support Multiple Career Pathways Programs with Information Provided (BM10a*)** (4 items: 10.1.2, 10.2.6, 10.1.3, *10.2.4*).

Comparison Between the EFA Results of the T1 and T2 Measures of BM10 Items (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--Forced 1 Factor

BM10a Engaging Parents to Support Multiple Career Pathways Programs (4 items)

- **10.2.6 Engaging Parents to Support Pathways Program**: "Are Parents given opportunities to support the delivery of the multiple pathways program such as inviting them to share their personal career adventure?" (.834)
- **10.1.2 Documentation on Promoting CLD Through Parent Engagement**: "Does your School have documentation specifically on promoting CLD education through parent engagement?" (.765)
- **10.1.3 Guiding Values in Parent Engagement**: "To what extent are the parent engagement endeavors based on some guided values (e.g., CLAP parent education)?" (.748)
- ***10.1.1 Staff Coordinating Parent Engagement**: "Does your school have at least one staff member coordinating parent engagement in relation to CLD including communication with parents?" (.585)*

Measured at T2 (variables with loadings > .55 are interpreted)--1 Factor

BM10a* Engaging Parents to Support Multiple Career Pathways Programs with Information Provided (4 items)

- **10.1.2 Documentation on Promoting CLD Through Parent Engagement**: "Does your School have documentation specifically on promoting CLD education through parent engagement?" (.812)
- **10.2.6 Engaging Parents to Support Pathways Program**: "Are Parents given opportunities to support the delivery of the multiple pathways program such as inviting them to share their personal career adventure?" (.746)
- **10.1.3 Guiding Values in Parent Engagement**: "To what extent are the parent engagement endeavors based on some guided values (e.g., CLAP parent education)?" (.696)
- ***10.2.4 Providing Multiple Pathways Information to Parents**: "Are parents provided with information about multiple pathways (e.g., multiple pathways information distributed to parents on parents day, information available through school systems or websites) and the supporting resources available to them (e.g., communicative channels, booklet, notes to parents)?" (.634)*

Results: Final EFAs on the 13 BM Factors from T1 and on the 13 BM Factors from T2

Summary of the 10 EFA Results Based on BMs Measured at T1 (Mar 11, 2023) – Resulting in 13 Factors

BM1a	BM1b	BM2a	BM2b	BM3a	BM4a	BM5a	BM6a	BM6b	BM7a	BM8a	BM9a	BM10a
Clear Policy & Strategy (3 items)	**Collection of Regular Feedback (1 item)**	**Teacher Leadership in CLD Programs Coordinati Support & Networking (6 items)**	**Teacher Leadershi p Training (2 items)**	**Evidence of Students' Identifying Multiple Career Pathways (1 item)**	**Diverse Career Exploratio n Activities to Identify Students' Needs (3 item)**	**Mechanis ms to Facilitate Student Co-creatio n of CLD Programs (4 items)**	**Counselin g Building Student Profiles and VASK (2 items)**	**Counseling Reviewing Personal Plans Through Records (3 items)**	**CLD Curriculu m (2 items)**	**Debriefing Tools and Workplace Learning for Senior Students (6 items)**	**FE/HE Programs for Senior Students (3 items)**	**Engaging Parents to Support Multiple Career Pathways Programs (4 items)**
BM1_1_1_StableCLDPolicy_Strategy	BM1_3_11_RegularFeedbackCollection	*BM2_1_3a_Networking_MaintainExpandNetworks*	*BM2_2_6_CareerTeam_ReceiveCPDAnnually*	BM3_2_4_ThreePossiblePathwaysByS6	BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	BM6_3_7_EnrichStudentPersonalProfiles	BM6_2_5_AnnualReviewUpdateOfPersonalPlans	BM7_1_1a_CLDConceptsInHolisticCurriculmDesign	BM8_2_7_ToolsDebriefStudentInteractiveEncounters	BM9_1_1_ProgramOnFurtherHigherEducation	BM10_2_6_EngageParentsSupportPathwayProgram
BM1_3_10_AppropriateLanguageForStakeholders		*BM2_1_2b_Management_MonitorSupportTeachers*	*BM2_2_5_CareerMaster_ReceiveCPDAnnually*		BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	BM5_2_4_StudentCocreateOneCLDProgramAnnually	BM6_3_8_ArticulateStudentVASK	BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3	BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles	*BM9_1_2_TwoMeaningfulVisitsToursAnnuallyByS6*	BM10_1_2_DocumentationPromoteCLDThruParentEngage
BM1_2_6_RegularPolicyReview		*BM2_1_3b_Networking_EstablishNewNetworks*			BM4_1_1b_Programs_ChallengeStereotypicalThinking	BM5_1_1_MechanismEngageStudentCocreation		BM6_2_6_RecordKeepingSystem		*BM8_1_5_DebriefFollowupWithStudents*	BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	BM10_1_3_GuidingValuesInParentEngagement
		BM2_1_1b_Leadership_LeadStakeholders				BM5_2_6_DocumenteStudentIdeasCocreationPlans				BM8_2_6_StudentInteractEmployersEmployeesByS6		BM10_1_1_StaffCoordinateParentEngagement
		BM2_1_4c_Coordination_CommunicateWithStakeholders								BM8_1_1_L1_ObservationalActivities		
		BM2_1_4a_Coordination_FacilitateTaskCompletion								BM8_1_4_WorkplaceLearningExpInSeniorForms		

Results of the Final EFA on the 13 Factors Based on BMs at T1 (Mar 12, 2023)

- Final Solution: Principal Axis Factoring with **Promax (Oblique)** Rotation on 3 Correlated Factors (with *r*[F1, F2]= .611, *r*[F1, F3] = .553, *r*[F2, F3] = .503, exceeding .32).
- SMCs (initial communalities) were acceptable; the factors did not explain a large of proportion of variance in BM7a_CLDCurriculum_2i .
- The 3 Factors explained 48% of the variance in the variables, with Factor 1 explaining 35%, Factor 2 7% of the variance, and Factor 3 6% of the variance..

Communalities

	Initial	Extraction
BM1a_ClearPolicyStrategy_4i	.606	.451
BM1b_CollectionOfRegularFeedback_1.3.11	.399	.280
BM2a_TeacherLeadershipCLDProgCoordination_6i	.599	.641
BM3a_EvidenceStudentsIdentifyingMultiCareerPaths_3.2.4	.602	.490
BM4a_DiverseCareerExplorActivitiesIdentifyNeeds_3i	.569	.580
BM5a_MechanismsFacilitateStudentsCocreation_4i	.415	.373
BM6a_CounselingBuildStudentProfilesVASK_2i	.581	.540
BM6b_CounselingReviewPersonalPlansThruRecords_3i	.449	.464
BM7a_CLDCurriculum_2i	.277	.199
BM8a_DebriefingToolsWorkplaceLearning_6i	.602	.619
BM9a_FEHEPrograms_3i	.595	.663
BM10a_EngagingParentsSupportMultiCareerPathsProg_4i	.525	.536
BM2b_TeacherLeadershipTraining	.526	.376

Extraction Method: Principal Axis Factoring.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 1 variable (BM7a_CLDCurriculum_2i) did not load on a factor.
- 1 variable (BM9a_FEHEPrograms_3i) was complex in this solution.
- Factor 1 (BM2a, BM1a, BM8a) describes **BM2a Teacher Leadership in CLD Program Coordination, BM1a Clear Policy and Strategy, and BM8a Debriefing Tools and Workplace Learning (L1 & L2) for Senior Students**
- Factor 2 (BM6b, BM2b) describes **BM6b Counseling to Review Student Personal Plans Through Records and BM2b Teacher Leadership Training**
- Factor 3 (BM5a, BM6a, BM3a, BM10a) describes **BM5a Mechanisms to Facilitate Students' Co-creation, BM6a Counseling to Build Student Profiles and VASK, BM3a Evidence of Students' Identifying Multiple Career Paths, and BM10a Engaging Parents to Support Multiple Career Paths**

Pattern Matrix[a]

	Factor 1	Factor 2	Factor 3
BM2a_TeacherLeadershipCLDProgCoordination_6i	.799		
BM1a_ClearPolicyStrategy_4i	.771		
BM8a_DebriefingToolsWorkplaceLearning_6i	.612		
BM9a_FEHEPrograms_3i	.524	.505	
BM6b_CounselingReviewPersonalPlansThruRecords_3i		.748	
BM2b_TeacherLeadershipTraining		.609	
BM4a_DiverseCareerExplorActivitiesIdentifyNeeds_3i		.502	
BM1b_CollectionOfRegularFeedback_1.3.11		.455	
BM7a_CLDCurriculum_2i		.376	
BM5a_MechanismsFacilitateStudentsCocreation_4i			.684
BM6a_CounselingBuildStudentProfilesVASK_2i			.650
BM3a_EvidenceStudentsIdentifyingMultiCareerPaths_3.2.4			.595
BM10a_EngagingParentsSupportMultiCareerPathsProg_4i			.552

Extraction Method: Principal Axis Factoring.

The three-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Teacher Leadership in Program Coordination, Clear Policy and Strategy, and L1-L2 Workplace Learning with Debriefing Tools (BM2A, BM1A, and BM8A)**; **F2 Counseling to Review Student Personal Plans Facilitated by Teacher Leadership Training (BM6A, BM2B)**; **F3 Student Engagement in Program Co-creation and Counseling to Build Student Profiles and VASK and to Identify Multiple Career Paths, Coupled with Engaging Parents to Support Multiple Career Paths (BM5A, BM6A, BM3A, BM10A)**.

Summary of the 10 EFA Results Based on BMs Measured at T2 (Mar 12, 2023) – Resulting in 13 Factors

BM1a*	BM1b*	BM2a*	BM2b*	BM3a*	BM4a*	BM5a*	BM6a*	BM6b*	BM7a*	BM8a*	BM9a*	BM10a*
Clear Policy, Infrastructure, & Strategy (4 items)	**Collection & Review of Regular Feedback on Policy Clear to Stakeholders (3 item)**	**Teacher Leadership in CLD Programs Implementation with Sharing & SM Communication (4 items)**	**Teacher Leadership in Support Giving and Stakeholders Coordination (3 items)**	**Training Students to Identify Multiple Career Pathways (3 items)**	**Use of Tools to Meet Diverse Student Needs, Challenge Views, & Record Experience (6 item)**	**Mechanisms to Facilitate Student Co-creation of CLD Programs (5 items)**	**Counseling to Consolidate Student VASK & ENOW to Set Life's Goals & Build Profiles (5 items)**	**Two Counseling Interviews by S3 & S6 (2 items)**	**CLD Curriculum by Trained Teachers (3 items)**	**Debriefing Tools and Workplace Learning for Senior Students (5 items)**	**FE/HE Programs with Two Interaction Opportunities for Senior Students (3 items)**	**Engaging Parents to Support Multiple Career Pathways Programs with Information (4 items)**
BM1_1_3_ManpowerBudgetInfrastructure	BM1_3_11_RegularFeedbackCollection	BM2_1_4a_CoordinationFacilitateTaskCompletion	*BM2_1_2b_Management_MonitorSupportTeachers*	*BM3_1_2_TrainingForStudentSearchProcessInfo*	BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	BM5_1_1_MechanismEngageStudentCocreation	BM6_3_8_ArticulateStudentVASK	BM6_1_2_ReceiveOnePersonalGuidanceInterviewByS3	BM7_1_1b_StandAloneCLDCurriculumTimetabledProg	BM8_2_7_ToolsDebriefStudentInteractiveEncounters	BM9_2_4_GuidanceLinkInteractionsWithCLDGoalsetting	BM10_1_2_DocumentationPromoteCLDThruParentEngage
BM1_2_6_RegularPolicyReview	*BM1_3_8_VisibleCLDPolicyForStakeholders*	*BM2_1_1a_Leadership_PIE*	*BM2_1_1b_Leadership_LeadStakeholders*	*BM3_2_5_ConfidentlyMakeInformedDecisionByS6*	BM4_2_2_CareerProvisions_TailoredToEachStudentNeeds	BM5_2_4_StudentCocreateOneCLDProgramAnnually	*BM6_3_9_ExtendStudentENOWExperience*	*BM6_1_3_ReceiveOnePersonalGuidanceInterviewByS6*	BM7_1_1a_CLDConceptsInHolisticCurriculumDesign	BM8_1_4_WorkplaceLearningExpInSeniorForms	*BM9_2_3_TwoInteractionOpportunitiesByS6*	BM10_2_6_EngageParentsSupportPathwayProgram
BM1_1_5_DesignatedInfrastructure	*BM1_3_12_FeedbackReviewInPlanning*	*BM2_3_9_AnnualInternalSharing*	*BM2_1_3a_Networking_MaintainExpandNetworks*	BM3_2_4_ThreePossiblePathwaysByS6	BM4_1_1b_Programs_ChallengeStereotypicalThinking	BM5_1_2_SupportiveMeasuresFacilitateStudentCocreation	*BM6_2_5_AnnualReviewUpdateOfPersonalPlans*		*BM7_1_2_TimeAllocationTrainedTeachers*	BM8_1_1_L1_ObservationalActivities	BM9_1_1_ProgramOnFurtherHigherEducation	BM10_1_3_GuidingValuesInParentEngagement
BM1_1_1_StableCLDPolicy_Strategy		*BM2_1_1c_Leadership_CommunicateWithSLT*			*BM4_1_1a_Programs_RaiseStudentAspirations*	*BM5_1_3_MechanismStudentGiveViewsOnCLDPrograms*	*BM6_2_4_IdentifiedPersonalLifeGoalsRoadmaps*			BM8_1_2_L2_ExperientialExpUnderstandWorkplaceRoles		*BM10_2_4_ProvideMultiplePathwayInfoToParents*
					BM4_3_3_ExplorationActivitiesIdentifyNeedsInterest	BM5_2_6_DocumenteStudentIdeasCocreationPlans	BM6_3_7_EnrichStudentPersonalProfiles			BM8_2_6_StudentInteractEmployersEmployeesByS6		
					BM4_4_5_CollectMaintainRecordsOnCLDExperiences							

Results of the Final EFA on the 13 Factors Based on BMs at T2 (Mar 12, 2023)

- Final Solution: Principal Components with **Promax (Oblique)** Rotation on 3 Correlated Factors (with *r*[F1, F2]= .518, *r*[F1, F3] = .382, *r*[F2, F3] = .332, exceeding .32).
- SMCs (initial communalities) were sizable; all factors did explain a large of proportion of variance in the variables
- The 3 Factors explained 59% of the variance in the variables, with Factor 1 explaining 39%, Factor 2 10% of the variance, and Factor 3 9% of the variance..

Communalities

	Initial	Extraction
BM1aR_ClearPolicyInfrastructureStrategy	1.000	.521
BM1bR_CollectReviewFeedbackOnPolicyClearToStakeholders	1.000	.600
BM2aR_TeacherLeadershipCLDProgCoordinationWithSharingSLTComm	1.000	.424
BM2bR_TeacherLeadershipSupportGivingCoordinationWithStakeholders	1.000	.584
BM3aR_TrainingStudentsIdentifyMultiCareerPaths	1.000	.712
BM4aR_UseToolsMeetDiverseNeedsChallengeViewsRecordExp	1.000	.603
BM5aR_MechanismsFacilitateCocreationOfCLDProg	1.000	.526
BM6aR_CounselingVASKENOWExpSetLifesGoal	1.000	.696
BM6bR_2CounselingInterviewsByS3S6	1.000	.644
BM7aR_CLDCurriculumByTrainedTeachers	1.000	.500
BM8aR_DebriefingToolsWorkplaceLearning	1.000	.605
BM9aR_FEHEProgramsWith2InteractionOpp	1.000	.633
BM10aR_EngagingParentsSupportMultiCareerPathsWithInfo	1.000	.606

Extraction Method: Principal Component Analysis.

- The Pattern Matrix shows the unique contribution of each factor to each variable.
- Using .45 as the cutoff value for interpreting a factor, 2 variables (BM2aR_TeacherLeadershipCLDProgCoordinationWithSharingSLTComm) did not load on a factor.
- 2 variables (BM2bR_TeacherLeadershipSupportGivingCoordinationWithStakeholders and BM1bR_CollectReviewFeedbackOnPolicyClearToStakeholders) were complex in this solution.
- Factor 1 (BM5a*, BM6a*, BM4a*, BM6b*, BM3a*) describes **BM5a* Mechanisms to Facilitate Co-creation, BM6a* Counseling to Consolidate VASK/ENOW to Set Life's Goal & Build Profiles, BM4a* Use of Tools to Meet Diverse Needs, BM6b* S3 & S6 Counseling Interviews, BM3a* Training Students to Identify Multiple Career Paths**
- Factor 2 (BM9a*, BM8a*, BM1a*) describes **BM9a* FE/HE Programs with Two Interaction Opportunities, BM8a* Debriefing Tools & L1-L2 Workplace Learning, BM1a* Clear Policy, Infrastructure, & Strategy**
- Factor 3 (BM10a*, BM7a*, BM1b*) describes **BM10a* Engaging Parents to Support Multiple Career Paths with Information Provided, BM7a* CLD Curriculum by Trained Teachers, BM1b* Collection & Review of Feedback on Policy Clear to Stakeholders**

Pattern Matrix[a]

	Component 1	2	3
BM5aR_MechanismsFacilitateCocreationOfCLDProg	.796		
BM6aR_CounselingVASKENOWExpSetLifesGoal	.743		
BM4aR_UseToolsMeetDiverseNeedsChallengeViewsRecordExp	.739		
BM6bR_2CounselingInterviewsByS3S6	.707		-.496
BM3aR_TrainingStudentsIdentifyMultiCareerPaths	.681		
BM9aR_FEHEProgramsWith2InteractionOpp		.828	
BM8aR_DebriefingToolsWorkplaceLearning		.797	
BM1aR_ClearPolicyInfrastructureStrategy		.641	
BM2aR_TeacherLeadershipCLDProgCoordinationWithSharingSLTComm		.503	
BM10aR_EngagingParentsSupportMultiCareerPathsWithInfo			.766
BM7aR_CLDCurriculumByTrainedTeachers			.692
BM1bR_CollectReviewFeedbackOnPolicyClearToStakeholders	.469		.578
BM2bR_TeacherLeadershipSupportGivingCoordinationWithStakeholders		.414	.467

The three-factor solution is chosen; variables with a loading > .55 are interpreted; **F1 Active Student Engagement in CLD Counseling & Program Co-creation to Meet Diverse Needs and Identify Multiple Career Paths (BM5A*, BM6A*, BM4A*, BM6B*, BM3A*)**; **F2 Debriefed Interaction Through FE/HE Programs and L1-L2 Workplace Learning by Clear Policy/Infrastructure/Strategy (BM9A*, BM8A*, BM1A*)**; **F3 Engagement of Parents and CLD Curriculum Design with Clear Policy to Stakeholders and Collection/Review of Feedback (BM10A*, BM7A*, BM1B*)**.

Comparison Between the Final EFA Results of the T1 Factors and the T2 Factors (Mar 13, 2023)

Measured at T1 (variables with loadings > .55 are interpreted)--Forced 3 Factors

F1: STRATEGIC CLD POLICY EMPHASIZING MEANINGFUL ENCOUNTERS WITH WORKPLACE AND TEACHER LEADERSHIP: Teacher Leadership in Program Coordination, Clear Policy and Strategy, and L1-L2 Workplace Learning with Debriefing Tools

- BM2a Teacher Leadership in CLD Program Coordination (6 items) (.799)
- BM1a Clear Policy and Strategy (4 items) (.771)
- BM8a Debriefing Tools and Workplace Learning (L1 & L2) for Senior Students (6 items) (.612)
- BM9a FE/HE Programs (3 items) (.524)

F2: COUNSELING REVIEWING PERSONAL PLANS BY TRAINED TEACHERS: Counseling to Review Student Personal Plans Facilitated by Teacher Leadership Training

- BM6b Counseling to Review Student Personal Plans Through Record (3 items) (.748)
- BM2b Teacher Leadership Training (2 items) (.609)
- BM4a Diverse Career Exploration Activities to Identify Needs (3 items) (.502)
- BM1b Collection of Regular Feedback (1 item) (.455)

F3: COUNSELING, CO-CREATION, AND PARENT ENGAGEMENT THAT HELPED IDENTIFY PATHS AND BUILD PROFILES/VASK: Student Engagement in Program Co-creation and Counseling to Build Student Profiles and VASK and to Identify Multiple Career Paths, Coupled with Engaging Parents to Support Multiple Career Paths

- BM5a Mechanisms to Facilitate Students' Co-creation (4 items) (.684)
- BM6a Counseling to Build Student Profiles and VASK (2 items) (.650)
- BM3a Evidence of Students' Identifying Multiple Career Paths (1 item) (.595)
- BM10a Engaging Parents to Support Multiple Career Paths (4 items) (.552)

Measured at T2 (variables with loadings > .55 are interpreted)--Forced 3 Factors

F1: STUDENT-NEEDS-ORIENTED COUNSELING, CO-CREATION, TOOL USE, AND TRAINING IN MULTI-PATHS INFO SEARCH: Active Student Engagement in CLD Counseling & Program Co-creation to Meet Diverse Needs and Identify Multiple Career Paths

- BM5a* Mechanisms to Facilitate Co-creation (5 items) (.796)
- BM6a* Counseling to Consolidate VASK/ENOW to Set Life's Goal & Build Profiles (5 items) (.743)
- BM4a* Use of Tools to Meet Diverse Needs (6 items) (.739)
- BM6b* S3 & S6 Counseling Interviews (2 items) (.707)
- BM3a* Training Students to Identify Multiple Career Paths (3 items) (.681)

F2: MEANINGFUL WORKPLACE AND FE/HE ENCOUNTERS PROGRAMS SUPPORTED BY CLEAR POLICY/INFRASTRUCTURE/STRATEGY: Debriefed Interaction Through FE/HE Programs and L1-L2 Workplace Learning by Clear Policy/Infrastructure/Strategy

- BM9a* FE/HE Programs with Two Interaction Opportunities (3 items) (.828)
- BM8a* Debriefing Tools & L1-L2 Workplace Learning (5 items) (.797)
- BM1a* Clear Policy, Infrastructure, & Strategy (4 items) (.641)
- BM2a* Teacher Leadership in CLD Program Coordination with Sharing and SLT Communication (4 items) (.503)

F3: PARENT ENGAGEMENT AND WHOLE-SCHOOL CLD CURRICULUM SUPPORTED BY COLLECTION & REVIEW OF FEEDBACK FROM STAKEHOLDERS: Engagement of Parents and CLD Curriculum Design with Clear Policy to Stakeholders and Collection/Review of Feedback

- BM10a* Engaging Parents to Support Multiple Career Paths with Information Provided (4 items) (.766)
- BM7a* CLD Curriculum by Trained Teachers (3 items) (.692)
- BM1b* Collection & Review of Feedback on Policy Clear to Stakeholders (3 items) (.578)
- BM2b* Teacher Leadership in CLD Program Coordination with Support Giving and Coordination with Stakeholders (3 items) (.467)