**Results Report – SPARK 1**

Title:  
Validation and Psychometric Analysis of the SPARK Questionnaire for Key Stage 3: Preliminary Findings and Future Directions

Abstract:  
This report presents the first iteration of the SPARK questionnaire, an instrument developed to assess key dimensions of student mindset in 11–14‑year‑olds. Analyses of the preliminary data reveal robust performance in some constructs (e.g., self-direction and learning engagement) while indicating limitations in areas such as resilience and parts of the knowledge domain. We detail our methods, findings, and planned refinements—including item modifications based on detailed item loading investigations, layout variations, and the adoption of a 100‑point slider for enhanced response fidelity. These results represent preliminary findings; further iterations and advanced analyses are planned.

Introduction:  
Recent educational research emphasizes the role of mindset in academic and personal success. The SPARK questionnaire was developed to capture essential dimensions such as Self-Direction, Purpose, Social Awareness, Resilience, and Knowledge in the Key Stage 3 population. This preliminary study presents the instrument’s conceptual framework, psychometric performance using Cronbach’s α, and detailed item analysis, followed by proposals for refinement in preparation for SPARK v2.

Methodology:

Instrument:  
The initial instrument (SPARK Questionnaire v1.docx) comprises items measured on a 5‑point Likert scale (later converted to a score out of 10) covering five constructs.

Sample & Data Collection:  
Data were collected from the target population (details available in SPARK1 Results.csv).

Analytical Techniques:

* Reliability was assessed using Cronbach’s alpha:  
  Self-Direction: 0.7325  
  Purpose: 0.8424  
  Awareness: 0.8117  
  Resilience: 0.1196  
  Knowledge: 0.5115
* Exploratory factor analysis was conducted to evaluate construct validity along with detailed item loading investigations.
* Preliminary item-total correlations identified specific items flagged for potential revision.

Results:

Reliability & Factor Structure:  
Constructs measuring Purpose and Awareness yield strong internal consistency (α ≈ 0.84 and 0.81, respectively), confirming their robust measurement of future-oriented purpose and socio-emotional awareness. Self-Direction shows acceptable reliability (α ≈ 0.73), yet certain items indicate potential for further refinement. In contrast, Resilience (α ≈ 0.12) and Knowledge (α ≈ 0.51) require substantive improvement.

Item Loading Analysis:

Self-Direction:

* “I am willing to risk failure to reach my goals” – Reference loading, set at 1.00
* “When I work at something I care about doing my best” – Loading ≈ 1.15
* “I like coming up with new ways to solve problems” – Loading ≈ 1.18
* “I am a leader, not a follower” – Loading ≈ 1.34
* “If I set goals I take action to reach them” – Loading ≈ 1.74
* “I always make plans to achieve my goals” – (Loading estimate available from our full model)

Purpose:  
Items such as “I expect good things to happen to me” and “I am excited about my future” loaded strongly with values typically near or above 1.0 and up to around 1.7. These robust loadings indicate that the items in this category are excellent reflections of a student’s future-oriented purpose.

Awareness:  
Items addressing empathy and understanding (for example, “I feel bad when someone gets their feelings hurt” and “I understand how those close to me feel”) generally loaded in the range of approximately 1.0 to 1.5, effectively capturing the construct of social and emotional awareness.

Resilience:  
Although these items are intended to measure persistence (e.g., “I work harder than others my age”, “I finish the tasks I start”), their loadings were inconsistent. The low Cronbach’s α (≈ 0.12) and variable factor loadings suggest that the items may not reliably measure the intended construct and need to be refined or reworded.

Knowledge:  
Items assessing academic identity and engagement (such as “If something interests me I try to learn more about it” and “I think the things I learn at school are useful”) produced moderate to strong loadings, typically in the range of around 1.0–1.6. Although these findings support that the items capture the academic self-perceptions, further refinement to improve clarity is warranted.

Discussion:  
While the overall factor structure aligns with our theoretical framework, the detailed analyses highlight that Purpose and Awareness are strongly measured and reliable. Conversely, the lower consistency in Resilience and Knowledge underscores the need for targeted revisions. These include refining item wording, reconsidering the underlying constructs, and conducting additional analyses (e.g., CFA, IRT) with a larger sample.

Planned Enhancements:

* **Item Revision:** Revised items (detailed in New SPARK Questions (SPARK v2).docx) will address the weaknesses in Resilience and Knowledge.
* **Scale Modification:** The transition from a 5‑point scale to a 100‑point slider aims to capture a more nuanced range of responses; scores will be averaged and then divided by 10 for comparability.
* **Layout Optimization:** Future iterations will test randomizing the presentation order of constructs to mitigate potential order effects.
* **Advanced Analyses:** Planned confirmatory factor analysis (CFA) and item response theory (IRT) modeling will further validate improvements in the instrument’s psychometric properties.

Conclusion:  
The first iteration of the SPARK questionnaire demonstrates a solid foundation for assessing key dimensions of student mindset, with Purpose and Awareness notably well captured. However, detailed item loading investigations reveal critical areas for improvement in the constructs of Resilience and Knowledge. The planned enhancements will refine item wording, adjust response scales, and optimize questionnaire layout, thereby strengthening the overall validity and utility of the instrument.