A LEADERSHIP FRAMEWORK
AND INSTRUMENT
FOR TECHNOLOGY INNOVATION IN SCHOOLS

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The Friday Institute mission
… is to advance education through innovation in teaching, learning, and leadership.

Features of a successful 1:1 environment
• on-going and embedded professional development to teachers
• specific 21st century skills and content integrated into the curriculum
• aligned standards, curriculum, instruction, and assessment
• effective leadership and community support
• a wireless, multimedia digital device for every student and teacher

Features of a successful 1:1 environment (continued)
• consistent broadband connectivity and wireless access throughout the school
• access to a high quality collection of media and digital resources
• policies to support future-ready teaching and learning
• a sustainable approach to funding (Muir, Manchester, & Moulton, 2005; Penuel, 2006; Rockman, 2000).

Evaluation Project
• 3-year evaluation of a 1:1 pilot initiative in 12 public high schools.
• The focus was
  • examine the extent to which schools implemented 1:1 initiative strategies and achieved 1:1 project objectives
  • inform local and state decision-makers on future technology policy and funding.
• One component of the overall evaluation was the identification of an effective leadership framework for technology innovation projects in schools.

Research Question
• Examine the role of leadership for technology innovation projects in schools.
• What are the characteristics of an effective school-level leader for technology innovation?
Developing a Framework

- Reviewed the following resources
  - Technology leadership themes and action steps from the Consortium for School Networking (2008)
  - 2009 National Educational Technology Standards (NETS-A) and Performance Indicators for Administrators
  - Qualitative data previously collected about aspects of effective leadership
    - online surveys
    - face-to-face focus groups with staff at the participating 1:1 schools.

From COSN, 2008

- 5 technology leadership themes and action steps
  - Strengthen district leadership and communications
  - Raise the bar with 21st century skills
  - Transform pedagogy with compelling learning environments
  - Support professional development and communities of practice
  - Create balanced assessments

2009 NETS, A and Performance Indicators for Administrators

- 5 standards
  - Inspire excellence through transformational leadership
  - Establish a robust digital age learning culture
  - Advance excellence in digital age professional practice
  - Ensure systemic transformation of the educational enterprise
  - Model and advance digital citizenship

Previously Collected Qualitative Data

- 5 themes emerged regarding effective leader behavior
  - Support professional development
  - Have reasonable expectations for integration
  - Model technology use
  - Provide resources and support
  - Communicate

Original Framework of Leadership for Technology Innovation

- Vision and Expectations
- Advocacy
- Infrastructure
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation

Original Framework of Leadership for Technology Innovation

- Vision and Expectations
  - Articulate a vision, exhibit excitement and buy-in.
  - Understand that incorporating technology may take more time for some people while others can act as technology leaders.
  - Indicate that the initiative is not a passing fad.
- Advocacy
- Infrastructure
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation
Original Framework of Leadership for Technology Innovation

- Vision and Expectations
- Advocacy
  - Leverage strategic partnerships to support the initiative,
  - Convene stakeholders to contribute to the development of technology-infused strategic plans.
  - Provide opportunities to showcase student work with stakeholders.
- Infrastructure
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation

- Vision and Expectations
- Advocacy
  - Secure or purchase needed resources (hardware, software, tech support, access to websites).
  - Arrange schedules to allow for common planning time and group reflection.
  - Establish flexible policies supportive to technology in the classroom.
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation

- Vision and Expectations
- Advocacy
  - Provide encouragement, visit the classroom, help with curriculum integration.
  - Encourage teachers to try innovative teaching strategies; reward the frequent, purposeful, and effective use of technology for learning.
  - Adapt and show contingency plans when things do not go as expected.
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation

- Vision and Expectations
- Advocacy
  - Encourage faculty to attend professional development.
  - Provide training opportunities specific to teacher needs.
  - Respond to requests for assistance.
  - Monitor teacher integration during classroom visits.
- Psychosocial Support
- Modeling
- Professional Development
- Shared Decision-Making
- Evaluation

- Vision and Expectations
- Advocacy
  - Provide opportunities to showcase student work with stakeholders.
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Original Framework of Leadership for Technology Innovation

- Vision and Expectations
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- Evaluation
  - Provide a time for getting and providing feedback.
  - Establish metrics, collect and analyze data, interpret results, and communicate findings to improve educator and student performance.

Item Generation & Content Validity Assessment

- Item generation: 98 initial items
- Content Analysis and Validation
- Lawshe’s Content Validity Ratio (CVR; 1975)
- SMEs rated items as:
  - 1 = Not necessary
  - 2 = Useful, but not essential
  - 3 = Essential
- Cut-off for item retention: 0.71
- 37 items retained.

STUDY 1

Questionnaire Administration

- Administered to 1:1 schools:
  - Sample 1: Spring/Fall of 2009 (n = 321)
  - Sample 2: Spring 2010 (n = 434)
- Web-based survey
- Response format (5-pt Likert-type agreement scale)
  - “Please indicate your degree of agreement with the following statements. Regarding the 1:1 Laptop Initiative, my principal...”

Teacher Demographics

- Gender
  - 56% female and 33% male
  - 11% did not specify
- Ethnicity
  - White/Caucasian (71%)
  - Black/African American (13%)
- Teaching experience
  - Ranged from 1 to 43 years
  - $M = 13.6, SD = 9.99$

Exploratory Factor Analysis (EFA)

- Sample 1: 37 items
- Specified a priori 8-factor solution
- Principal axis factoring with Promax rotation
- Proportion of variance accounted for, scree plot, and interpretability criteria
- Six factors accounted for 81% of the variance, two trivial factors were dropped:
  - Shared Decision Making, Advocacy, Infrastructure, Information Collection and Communication, Professional Development, and Vision
Reliability: Scale and Item Analysis

- Cronbach’s Alpha (α)
- Item analysis
  - Item-total correlation
  - Alpha-if-item-dropped
  - Squared multiple correlation

Confirmatory Factor Analysis (CFA)

- Specified a 6-factor CFA model
- Maximum likelihood (ML) estimation
- Tested the null hypothesis that $\Sigma = S$
- Tests of model fit:
  - $\chi^2$
  - CFI and TLI (absolute fit)
  - RMSEA and SRMR (incremental fit)
- 6 separate 1-factor CFAs for each dimension

Study 1: CFA Results

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<thead>
<tr>
<th>Information Collection and Communication</th>
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<td>Uses clearly defined criteria for assessing 1:1 laptop integration.</td>
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<td>.016</td>
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<td>Uses multiple sources of data for evaluating the impact of technology on student outcomes.</td>
<td>.856</td>
<td>.015</td>
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<td>Communicates how teacher performance will be assessed.</td>
<td>.844</td>
<td>.015</td>
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<td>Promotes the legal and ethical use of information and technology (e.g., respect for copyright, intellectual property).</td>
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</tr>
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<td>Effectively communicates via technology.</td>
<td>.809</td>
<td>.018</td>
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Study 1: Final Set of Items

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Questionnaire Administration

- Administered to 1:1 schools in one county:
  - Spring 2011 (n = 95)
- Web-based survey
- Response format (5-pt Likert-type agreement scale)
- “Please indicate your degree of agreement with the following statements. Regarding the 1:1 Laptop Initiative, my principal...”

STUDY 2
Teacher Demographics

- **Gender**
  - 56% female and 22% male
  - 21% did not specify

- **Ethnicity**
  - White/Caucasian (55%)
  - Black/African American (14%)

- **Teaching experience**
  - Ranged from 1 to 50 years
  - \( M = 10.7, \text{SD} = 10.1 \)

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Study 2: CFA Results

**Fix Indices and Model Comparisons**

<table>
<thead>
<tr>
<th>Model</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>33.64</td>
<td>9</td>
<td>0.93</td>
<td>0.88</td>
<td>0.17</td>
<td>0.05</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>2.42</td>
<td>2</td>
<td>1.00</td>
<td>0.99</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>Professional Development</td>
<td>69.87</td>
<td>14</td>
<td>0.87</td>
<td>0.80</td>
<td>0.21</td>
<td>0.08</td>
</tr>
<tr>
<td>Shared Decision Making</td>
<td>54.91</td>
<td>14</td>
<td>0.93</td>
<td>0.90</td>
<td>0.18</td>
<td>0.04</td>
</tr>
<tr>
<td>Advocacy</td>
<td>3.43</td>
<td>2</td>
<td>1.00</td>
<td>0.99</td>
<td>0.09</td>
<td>0.02</td>
</tr>
<tr>
<td>Evaluation</td>
<td>20.35</td>
<td>2</td>
<td>0.93</td>
<td>0.78</td>
<td>0.31</td>
<td>0.05</td>
</tr>
</tbody>
</table>

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Study 2: Final Set of Items

**Vision (\( \alpha = .89 \))**

- Believes in the technology innovation project. \( 0.626, 0.069 \)
- Has articulated a vision for the school’s technology innovation project. \( 0.854, 0.036 \)
- Has established clear objectives and goals for our school to meet on the project. \( 0.862, 0.034 \)
- Communicates how the technology innovation project supports the larger strategic plan for the school. \( 0.845, 0.037 \)
- Models effective use of technology. \( 0.765, 0.049 \)
- Promotes the legal and ethical use of technology (e.g., respect for copyright, intellectual property). \( 0.592, 0.072 \)

**Infrastructure (\( \alpha = .81 \))**

- Designs policies for the appropriate use of technology. \( 0.679, 0.069 \)
- Makes sure teachers have access to technology tools that facilitate their work (e.g., smartboards, classroom management software). \( 0.746, 0.061 \)
- Ensures technical support is available. \( 0.615, 0.077 \)
- Ensures an appropriate infrastructure is maintained (e.g., wireless connection, IT support, server space, extra laptops, power strips) in the school. \( 0.834, 0.054 \)

**Professional Development (\( \alpha = .94 \))**

- Supports professional development by providing resources such as substitutes, release time, etc. \( 0.746, 0.052 \)
- Understands the professional development needs of teachers. \( 0.909, 0.027 \)
- Participates in administrative professional development. \( 0.771, 0.047 \)
- Encourages teachers to incorporate innovative technology into their instructional strategies. \( 0.528, 0.08 \)
- Understands that incorporating technology into the curriculum may take more time for some people. \( 0.677, 0.061 \)
- Evaluates the effectiveness of professional development. \( 0.894, 0.038 \)

**Shared Decision Making (\( \alpha = .94 \))**

- Makes me feel comfortable in expressing my concerns or opinions about the laptop initiative. \( 0.798, 0.04 \)
- Includes teachers in decisions about school policies on student use of technology. \( 0.906, 0.022 \)
- Includes teachers in decisions about measuring student and teacher success in technology integration. \( 0.923, 0.019 \)
- Trusts teachers to make sound decisions about technology integration in instruction. \( 0.711, 0.053 \)
- Requests feedback from teachers about the 1:1 Initiative. \( 0.769, 0.045 \)
- Provides time for us to solve problems as a team. \( 0.91, 0.022 \)
- Sets ambitious, yet realistic goals for integrating technology (i.e., not too high, and not too low). \( 0.808, 0.039 \)
Study 2: Final Set of Items

**Advocacy (α = .92)**

<table>
<thead>
<tr>
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<tr>
<td>Secures funding for the 1:1 Initiative.</td>
<td>0.745</td>
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<tr>
<td>Takes steps to ensure the sustainability of the 1:1 Initiative.</td>
<td>0.798</td>
</tr>
<tr>
<td>Advocates for policies that support our 1:1 Initiative at the district level.</td>
<td>0.945</td>
</tr>
<tr>
<td>Leverages strategic partnerships to support the 1:1 Initiative.</td>
<td>0.928</td>
</tr>
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</table>

**Evaluation (α = .89)**

<table>
<thead>
<tr>
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<tr>
<td>Uses clearly defined criteria for assessing technology integration.</td>
<td>0.7</td>
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<tr>
<td>Uses multiple sources of data for evaluating the impact of technology on student outcomes.</td>
<td>0.731</td>
</tr>
<tr>
<td>Communicates how teacher performance will be assessed.</td>
<td>0.942</td>
</tr>
<tr>
<td>Provides constructive feedback to teachers.</td>
<td>0.894</td>
</tr>
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</table>

Conclusions

- One area that has not been thoroughly researched is leadership for a 1:1 learning environment as an innovation in schools.
- Schools need resources for leadership development in this unique school context, as well as tools for assessing the quality of leadership.
- The leadership framework developed as a result of this study, as well as the new 1:1 Leadership for Technology Innovation Scale, addresses this growing need.

Implications

- Leadership framework can be used to design development programs for principals
- 1:1 Leadership for Technology Innovation Scale can be used as a tool to determine developmental needs of specific principals

Future Research

- Address convergent, discriminant, and criterion related validity evidence

For additional information, contact Jeni Corn at jeni_corn@ncsu.edu.

References

Study 1: Final Set of Items

### Vision (α = .95)

<table>
<thead>
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<tbody>
<tr>
<td>Sets ambitious, yet realistic goals for integrating technology (i.e., not too high, and not too low).</td>
<td>.892</td>
</tr>
<tr>
<td>Believes in the laptop initiative.</td>
<td>.900</td>
</tr>
<tr>
<td>Has articulated a vision for the school’s laptop initiative.</td>
<td>.909</td>
</tr>
<tr>
<td>Has established clear objectives and goals for our school to meet on the 1:1 initiative.</td>
<td>.925</td>
</tr>
<tr>
<td>Communicates how the laptop initiative supports the larger strategic plan for the school.</td>
<td>.847</td>
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### Infrastructure (α = .91)

<table>
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<tbody>
<tr>
<td>Designs policies for the appropriate use of technology.</td>
<td>.820</td>
</tr>
<tr>
<td>Makes sure teachers have access to technology tools that facilitate their work (e.g., smartboards, classroom management software).</td>
<td>.848</td>
</tr>
<tr>
<td>Ensures technical support is available.</td>
<td>.892</td>
</tr>
<tr>
<td>Ensures an appropriate infrastructure is maintained (e.g. wireless connection, IT support, server space, extra laptops, power strips) in the school.</td>
<td>.863</td>
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### Professional Development (α = .94)

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<tr>
<td>Makes sure that opportunities for professional development are available.</td>
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</tr>
<tr>
<td>Supports professional development by providing resources such as substitutes, release time, etc.</td>
<td>.786</td>
</tr>
<tr>
<td>Understands the professional development needs of teachers.</td>
<td>.890</td>
</tr>
<tr>
<td>Participates in administrative professional development.</td>
<td>.805</td>
</tr>
<tr>
<td>Encourages teachers to incorporate innovative technology into their instructional strategies.</td>
<td>.847</td>
</tr>
<tr>
<td>Understands that incorporating technology into the curriculum may take more time for some people.</td>
<td>.832</td>
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<td>Evaluates the effectiveness of professional development.</td>
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### Shared Decision Making (α = .94)

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<td>Provides time for us to solve problems as a team.</td>
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### Advocacy (α = .91)

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<td>Advocates for policies that support our 1:1 Initiative at the district level.</td>
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</tr>
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<td>Leverages strategic partnerships to support the 1:1 Initiative.</td>
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### Information Collection and Communication (α = .92)

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