

**Inquiry-based Instruction: Cultivating Analytical  
Habits of Mind with 21<sup>st</sup> Century Skills:  
A Quantitative Approach<sup>1</sup>**

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<sup>1</sup>Paper presented at the 45<sup>th</sup> annual meeting of the northeastern

Educational Research Association, Trumbull, CT, October 23, 2014.

## ABSTRACT

Promotion of sustainable, inquiry-based, analytic habits of mind for STEM success is a priority. Inquiry techniques in K-12 urban classrooms with greatest equity gaps and teacher self-efficacy were explored for differences across contents and levels of preparation for frequency, inquiry, and self-efficacy in implementing 21<sup>st</sup> century skills.

The analyses explored 21<sup>st</sup> Century Skills related to *Webb's Depth of Knowledge* (Webb, 1997b; Webb, 2009) and teacher self-efficacy based on Bandura (2006, 2013) using descriptive and comparative analyses (Gall, Gall, & Borg, 2007; Huck, 2013) with Cronbach's alpha for reliability, analysis of variance (ANOVA), and *t*-tests. Quantitative findings indicated differences regarding teacher preparation and content areas. Teacher self-efficacy findings denoted further exploration.

Research questions were:

1. Are there differences across content areas with respect to frequency, level of inquiry, and self-efficacy in implementing instructional practices that employ 21<sup>st</sup> century skills in the classroom?
2. Are there differences in teachers' self-efficacy for teaching content through inquiry with 21<sup>st</sup> century skills for the following levels of educators' preparation program:
  - A. Elementary, secondary, and both levels, or
  - B. Elementary and secondary?

This mixed method sequential explanatory study sampled *N*=175 teachers in urban schools where equity gaps are greatest, using an online survey to quantitate frequency, inquiry and teacher self-efficacy in implementing 21<sup>st</sup> century skills in K-12 classrooms of elementary and secondarily prepared educators with expertise in STEM, Humanities, or Social and Vocational Supports. Put in some key findings here

Findings should be of interest to varied audiences focused on workforce innovation for 21<sup>st</sup> century global readiness and those tasked with professional development and teacher preparation initiatives that must meet teachers' needs to support inquiry practices in K-12 classrooms.

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## I. STUDY PURPOSE

The purpose of this sequential explanatory, mixed methods study was to identify the current levels of instructional practices involving inquiry techniques related to 21<sup>st</sup> century skills and *Webb's Depths of Knowledge* in use by teachers and determine their levels of self-efficacy in regards to applying such practices. The focus of this work highlights the quantitative components of that study for the purposes of this presentation.

Associations between educator self-efficacy and utilization of 21<sup>st</sup> century skills across content areas using web-enabled, self-administered surveys was employed for the quantitative portion of the study. (Appendix B).

A single-stage, non-random sample of certified K-12 public school teachers from  $N=8$  elementary and  $N=4$  secondary urban RI schools were utilized. Schools were selected from districts of urban and urban ring classification, as these are the areas characterized by the greatest pervasive achievement gaps. Review of New England Common Assessment Program (NECAP) science, math, and English language arts performance data revealed markedly lower achievement levels for students in urban and urban ring schools (Tucker-Seeley, 2013a, 2013b). Selection was based on recruitment of larger schools to target larger potential data sets as greater numbers of teachers were available to sample. Elementary and secondary schools from within the same district were recruited to include teachers from disciplines that span grades K-12. Principals were invited to have their teachers participate; multiple invitations were made at the elementary level to obtain comparable sample sizes between elementary and secondary participants. A total of  $N=73$  elementary

teachers and  $N=102$  secondary teachers responded to the online survey representing 42% and 58% of the study responses respectively (Tables 1, 2). Stratification by content area and teacher preparation was utilized.

## II. RESEARCH QUESTIONS

The research questions addressed included:

1. Are there differences across content areas with respect to frequency, level of inquiry, and self-efficacy in implementing instructional practices that employ 21<sup>st</sup> century skills in the classroom?
2. Are there differences in teachers' self-efficacy for teaching content through inquiry with 21<sup>st</sup> century skills for the following levels of educators' preparation program:
  - C. Elementary, secondary, and both levels, or
  - D. Elementary and secondary?

## III. THEORETICAL FRAMEWORK

*The 21<sup>st</sup> Century Skills Assessment*, a quantitative survey deemed an effective basis by which to gather quantitative data (Fowler, 2014; Gall, Gall, & Borg, 2007), consisted of a combination of items presented in three sections titled, *Section I: Instructional Practice*, *Section II: Confidence in Implementing Instructional Practices*, and *Section III: Information About You*. The primary design of the 27 items in Section I centered on four domains of 21<sup>st</sup> century skills: *Research*, *Cognition*, *Communication*, *Civic Contribution*, and four *Depths of Knowledge* levels (DOK-level) to characterize the instructional practices in place in the classroom. Each domain or DOK-level was represented by three to four items to assess frequency of instructional practices. Section II contained 27 items that targeted the same domain and DOK-levels in assessing teacher self-efficacy regarding the instructional practices presented. Section III incorporated demographic characteristics in five items. Five-point Likert-scaled responses were used to

conduct measurements regarding frequency of instructional practices, confidence levels in using those practices and job satisfaction rates (Bandura, 2013; McCoach, Gable, & Madura, 2013). This web-based, Internet survey titled, *The 21<sup>st</sup> Century Skills Assessment*, was administered on-line via confidential data collection.

Content validity of the questionnaire items was based on the judgments of  $N=4$  education doctoral faculty and findings from the literature to incorporate the four 21<sup>st</sup> century skills domains (Griffin, McGaw, & Care, 2012; Koenig, 2011; Kuhlthau, Maniotes, & Caspari, 2007; "Our vision and," 2013; King, Kay, LeMahieu, & Wells, 2013; Binkley, Erstad, Herman, Raizen, Ripley, & Rumble, 2013), with focus on inquiry related to *Webb's Depth of Knowledge* (Webb, 1997a; Webb, 1997b; Webb, 2002; Webb, 2006; Webb, 2009) and teacher Self-Efficacy from Bandura (1977a, 1977b, 1982a, 1982b, 1986, 1989a, 1989b, 1993, 1997, 2001, 2006), Bandura, Barbaranelli, Caprara, & Pastorelli (1996), Bandura, Adams, Hardy, & Howells (1980), and Bandura & Locke (2003). Frequency of inquiry was defined as how often such practices are utilized in the school year. The inquiry levels employed were correlated to actionable frames of reference from *Webb's Depth of Knowledge* chart (Webb, 2006). Self-efficacy was operationally defined as individual perceptions of self-confidence requiring students to use a variety of 21<sup>st</sup> century tasks. Web-based surveys with frameworks from 21<sup>st</sup> century skills consortia, Webb, and Bandura, were trailed by focus groups, to supply insight regarding teachers' confidence levels and thoughts. Pilot testing with  $N=5$  teachers on two survey versions allowed for alterations prior to the start of formal data collection.

Survey data were analyzed at the domain level with Cronbach's alpha reliabilities generated for each domain. Domains with alpha reliabilities of at least .80 were analyzed at the domain level. If a domain was defined by items resulting in domain-level reliabilities of less than .80, then only item-level analysis was conducted.

Construct validity of the domains assessed by the questionnaire employed an exploratory factor analysis of the items to identify strong and weak relationships among items and allowed for appropriate aggregation or dispersion to minimize impacts on data reliability and instrument validity (Huck, 2013; Gall, Gall, & Borg, 2007; McCoach, Gable, & Madura, 2013).

#### IV. METHODOLOGY

**Survey Administration.** This section should talk about administration only--the survey description and validity reliability info goes in the Instrumentation section later. SurveyMonkey was used to create the survey with access links emailed to principals for distribution to all teachers in participating schools (Fowler, 2014). The *21<sup>st</sup> Century Skills Assessment* included four domains of *Research*, *Cognition*, *Communication*, and *Civic Contribution* synthesized from 21<sup>st</sup> century skills resources (Amos, 2013; Binkley, Erstad, Herman, Raizen, Ripley, & Rumble, 2013; Donn, Giacin, Gollenberg, & Mervis, 2013; Greenstein, 2012; Griffin et al., 2012; Kay & Golder-Dardis, 2009; King, Kay, LeMahieu, & Wells, 2013; Yarnall, 2011) with inquiry domains quantified by Webb's DOK (Webb, 2006). Frequency and DOK levels used a 5-point Likert scale: *Never* =1, *Once a year* =2, *Once a month* =3, *Once a week* =4, and *Daily* =5, while self-efficacy used an end-point only

Likert scale: *Not Very Confident* = 1, to *Very Confident* = 5 (McCoach, Gable, & Madura, 2013).

**Validity and Reliability.** The *21<sup>st</sup> Century Skills Assessment* content validity was supported by content expert review ( $N=6$ ) and literature (Bandura, 1977a; Bandura, 1977b; Bandura, 1982a; Bandura, 1982b; Bandura, 1986; Bandura, 1989a; Bandura, 1989b; Bandura, 1993; Bandura, 1997; Bandura, 2001; Bandura, 2006; Bandura, 2013; Bandura et al., 1996; Bandura et al., 1980; Bandura & Locke, 2003; Binkley et al., 2013; Donn et al., 2013; Griffin et al., 2012; King et al., 2013; Koenig, 2011; Kuhlthau et al., 2007; McCoach et al., 2013; Rosefsky & Opfer, 2012; Webb, 1997a; Webb, 1997b; Webb, 2002; Webb et al., 2006; Webb, 2009; Yarnall, 2011).

The 21<sup>st</sup> Century Skills and Inquiry Level Variables were derived by item-level factor analyses. All items in the dimensions of *Research*, *Cognition* and *Communication* were highly reliable ( $\alpha = .81$ ). The *Civic Contribution* dimension did not meet our criterion of  $\alpha = .72$ , so item-level analyses were used. Cronbach's alpha for all items as a single dimension revealed high reliability ( $\alpha = .89$ ). The *DOK1* and *DOK2* dimensions did not result in high reliabilities ( $\alpha = .68$ ) and ( $\alpha = .70$ ); however, *DOK3* and *DOK4* did at  $\alpha = .80$  and  $\alpha = .85$  with all-item inquiry level frequency components to be one factor at  $\alpha = .91$ .

Self-Efficacy dimension data for *Research*, *Cognition*, *Communication* and *Civic Contribution* had reliabilities ranging from .85 to .90, and from .82 to .92 for DOK levels.

**Data Analysis.** Descriptive statistics were generated for all variables. Domain data reliability was assessed through checks for Cronbach's alpha internal



consistency with a criterion of .80 (Huck, 2013). Research questions were analyzed using multiple 1-way ANOVAs for each content area in comparison to frequency, level of inquiry and self-efficacy. Post Hoc Scheffe' comparisons followed any significant *F* values (after Bonferonni adjustment for probability) to determine variables contributing to significance. Effect sizes (partial eta-squared) were reported for significant findings.

## **V. RESULTS** The quantitative, online survey was designed

to examine differences across content areas of instruction with respect to frequency, level of inquiry, and self-efficacy in implementing instructional practices requiring 21<sup>st</sup> century skills in the classroom. The relationship of an educator's preparation program to the level of a teacher's self-efficacy in using inquiry practices to study classroom content was assessed in respect to 21<sup>st</sup> century skills and with tasks defined by Webb's Depths of Knowledge.

### NOW PUT IN YOUR FINDINGS

The Participants, Instrument, and **Deriving 21<sup>st</sup> Century Skills Variables**

**Deriving Inquiry Level Variables and Deriving Variables: Self-Efficacy with Respect to 21<sup>st</sup> Century Skills. The "Deriving" sections are part of describing the Instruments** sections go earlier as part of Methodology

**Participants.** A total of *N*=12 principals across two urban-ring school districts in Rhode Island agreed to distribute the *21<sup>st</sup> Century Skills Assessment* to all teachers in their schools by email. Districts were selected after review of Rhode Island Department of Education Data ("Aggregate report creator," 2013) to select urban-

ring districts with reasonable potential to obtain adequate responses from kindergarten through grade 12 teachers (K-12).

Surveys distributed over a seven-day period resulted in an overall 27% teacher response rate, with 10% variance between districts reporting 33% and 23% respectively, establishing a data set of  $N=175$  participants (Table 1). This is survey administration and goes in your earlier section

Participant equivalency rates were assessed and indicated that approximately two thirds of district K-12 teachers are comprised of secondary level teachers at 61% compared to 39% at the elementary level, respectively (Table 2). The respondent rates from the quantitative questionnaire represented this demographic fairly well at 58% to 42% secondary to elementary level (Table 2).

**Instrument.** The *21<sup>st</sup> Century Skills Assessment* incorporated domains of *Research, Cognition, Communication, and Civic Contribution* found in Table 3 were developed from the review and synthesis of information from a number of 21<sup>st</sup> century skills resources located online and in traditionally published formats (Amos, 2013; Greenstein, 2012; Griffin et al., 2012; Kay & Golder-Dardis, 2009; King, Kay, LeMahieu, & Wells, 2013; Donn, Giacin, Gollenberg, & Mervis, 2013; Binkley, Erstad, Herman, Raizen, Ripley, & Rumble, 2013; Yarnall, 2011). Additional domains to assess level of inquiry skills applied in the classroom as quantified by Webb's Depths of Knowledge (DOK) found in Table 4 were established as *DOK 1*, *DOK 2*, *DOK 3*, and *DOK 4* in accordance to the action skills outlined in *Webb's DOK Wheel*, more formally known as the *Webb's Depth of Knowledge Alignment Tool* (Webb, 2006). The action verbs or skills in each category or level of the wheel

were grouped by common themes using the qualitative method of Krippendorff (2013) to create the survey items within each DOK level construct. Frequency and DOK levels were quantified using a 5-point Likert scale with responses ranging on a continuum as follows: *Never* =1, *Once a year* =2, *Once a month* =3, *Once a week* =4, and *Daily* =5 to establish specificity at defined intervals.

Self-efficacy measurements utilized identical item stems applied in frequency of 21<sup>st</sup> century skills and DOK levels are outlined in Tables 5 and 6 whereby respondents were asked to quantify their perceived level of confidence using a five-interval, end-point Likert scale with a continuum range from *Not Very Confident* =1, to *Very Confident* = 5 with visually unlabeled intervals at 2, 3, and 4 in between (McCoach, Gable, & Madura, 2013). Additional items were included to assess content area of daily instruction, educator preparation program type and year completed, whether education was the educator's primary or secondary career choice, number of years the educator has been teaching, number of years in the currently reported position, and level of job satisfaction with current teaching assignment. The content validity for the three major questionnaire components, 21<sup>st</sup> Century Skills, Level of Inquiry, and Self-Efficacy are supported by the literature outlined in Table 7. Expert review ( $N=6$ ) of the questionnaire items derived from literature-supported constructs was completed to further support the content and face validity of the design. This six-member review panel consisted of a director of university research, two education professors with expertise in quantitative and qualitative research, a director of a principal residency and preparation program, an outside expert reviewer, and an external panel discussant from the Northeastern

Educational Research Association (NERA). The quality of the *21<sup>st</sup> Century Skills Assessment* was improved through incorporation of feedback from all expert reviewers.

**Deriving 21<sup>st</sup> Century Skills Variables.** An item level factor analysis was conducted with all frequency data generated from the *21<sup>st</sup> Century Skills Assessment*. These items were considered essential 21<sup>st</sup> century skills in the literature for successful academic and workforce readiness (Amos, 2013; Griffin et al., 2012; Kuhlthau, Maniotes, & Caspari, 2007; Kay & Golder-Dardis, 2009; King, Kay, LeMahieu, & Wells, 2013; Donn, Giacin, Gollenberg, & Mervis, 2013; Binkley, Erstad, Herman, Raizen, Ripley, & Rumble, 2013; Yarnall, 2011). All items in the *Research* dimension from the frequency components of the *21<sup>st</sup> Century Skills Assessment* (items 1a-d) were found to be one factor with high reliability ( $\alpha = .81$ ) as seen in Table 8. The data established appropriateness use of the mean for all *Research* items (items 1a-d).

Item level factor analysis of all items in the *Cognition* dimension of the *21<sup>st</sup> Century Skills Assessment* (items 1e-h) were also found to be one factor with high reliability ( $\alpha = .81$ ) as seen in Table 8.

The *Communication* dimension of the *21<sup>st</sup> Century Skills Assessment* (items 1i-l) was also found to be one factor with high reliability ( $\alpha = .81$ ) as seen in Table 8.

The *Civic Contribution* dimension of the *21<sup>st</sup> Century Skills Assessment* (items 1m-o) did not represent one factor with high reliability ( $\alpha = .72$ ). Mean response percentages indicated that entrepreneurship (item 1o) exhibited visually evident variation from community problem solving skills (items 1m-n) as seen in Table 8.

Cronbach's alpha for all items (items 1a-o) as a single 21<sup>st</sup> century skills dimension revealed high reliability ( $\alpha = .89$ ) even with inclusion of the clear outlier, entrepreneurship (item 1o).

**Deriving Inquiry Level Variables.** Frequency data generated from the inquiry level dimensions (items 2a-l) in *21<sup>st</sup> Century Skills Assessment* were examined through item level factor analysis. The dimensions of Depth of Knowledge 1 (*DOK 1*) (items 2a-c) and Depth of Knowledge 2 (*DOK 2*) (items 2d-f) did not result in high reliability at ( $\alpha = .68$ ) and ( $\alpha = .70$ ) respectively. Further work is needed at these lower levels of inquiry to further define and differentiate the skills. It is well documented that there can be overlap in the skills related to the action verbs within adjacent DOK levels depending on the task details that are required (Webb, 1997a; Webb, 1997b; Webb, 2002; Webb, 2006; Webb, 2009), which may be the contributing factor to the lack of high reliability in these two dimensions. All items in the dimensions of Depth of Knowledge 3 (*DOK 3*) (items 2g-i) and Depth of Knowledge 4 (*DOK 4*) (items 2j-l) did result in high reliability at ( $\alpha = .80$ ) and ( $\alpha = .85$ ) respectively. All items in the inquiry level frequency components of the *21<sup>st</sup> Century Skills Assessment* (items 2a-l) were found to be one factor with high reliability ( $\alpha = .91$ ) as seen in Table 9.

**Deriving Variables: Self-Efficacy with Respect to 21<sup>st</sup> Century Skills.** Table 10 revealed quaternary dimensionality with respect to Self-Efficacy measurement in regards to 21<sup>st</sup> Century Skills. High reliabilities were acquired for all four dimensions of *Research* (items 3a-d), *Cognition* (items 3e-h), *Communication* (items 3i-l), and *Civic Contribution* (items 3m-o) with reliability values at ( $\alpha = .89$ ), ( $\alpha = .89$ ), ( $\alpha = .90$ ),

and ( $\alpha = .85$ ), respectively. When assessed as a single Self-Efficacy dimension (items 3a-l), Cronbach's alpha indicated high reliability ( $\alpha = .94$ ).

Self-Efficacy with respect to inquiry levels at *DOK 1* (items 4a-c), *DOK 2* (items 4d-f), *DOK 3* (items 4g-i), and *DOK 4* (items 4j-l), signified four highly reliable dimensions at ( $\alpha = .82$ ), ( $\alpha = .82$ ), ( $\alpha = .89$ ), and ( $\alpha = .92$ ), respectively. Table 11 clearly exhibits this information for further observation. Cronbach's alpha reliability of a single self-efficacy dimension with respect to inquiry levels (items 4a-l) was high at ( $\alpha = .94$ ).

**Data Analysis.** The quantitative data were analyzed using the following approaches (Gall, Gall, & Borg, 2007; Huck, 2013):

1. Collection response rates were complied and analyzed at the school level in respect to percent respondents in comparison to total educators at the site (Table 1).
2. School-level educator demographics prepared for elementary or secondary education were compared for all K-12 educators versus survey responses (Table 2).
3. Descriptive statistics including frequency, means, and standard deviations, and factor analyses were run on four sets of instrument items: Frequency of 21<sup>st</sup> Century Skills Applications, Inquiry Level of 21<sup>st</sup> Century Skills Applications, Educator Self-Efficacy with Respect to Frequency of 21<sup>st</sup> Century Skills Applications, and Educator Self-Efficacy with Respect to Inquiry Level of 21<sup>st</sup> Century Skills Applications (see Tables 8, 9, 10, and 11).
4. Cronbach's alpha internal consistency reliabilities were generated for each item in the factors, in addition to the literature-determined factor sets to determine the reliable factors (see Tables 8, 9, 10, and 11).

5. Analysis of Variance (ANOVA) for educators with preparation in Science, Technology, Engineering and Math (STEM) and educators with preparation in the Humanities or Social and Vocational Support areas were compared in respect to Frequency of 21<sup>st</sup> Century Skills Applications, Inquiry Level of 21<sup>st</sup> Century Skills Applications, Educator Self-Efficacy with Respect to Frequency of 21<sup>st</sup> Century Skills Applications, and Educator Self-Efficacy with Respect to Inquiry Level of 21<sup>st</sup> Century Skills Applications (see Tables 12, 13, 14, and 15). In order to control for an inflated Type I error rate, the Bonferroni adjustment technique was used to determine significance. All items deemed to have significant differences were followed by post hoc Scheffe' analyses to determine significance.
6. Analysis of Variance (ANOVA) for educators with preparation Elementary Education and educators with preparation in Secondary Education or Elementary and Secondary Education were compared to Frequency of 21<sup>st</sup> Century Skills Applications, Inquiry Level of 21<sup>st</sup> Century Skills Applications, Educator Self-Efficacy with Respect to Frequency of 21<sup>st</sup> Century Skills Applications, and Educator Self-Efficacy with Respect to Inquiry Level of 21<sup>st</sup> Century Skills Applications (see Tables 16, 17, 18, and 19). In order to control for an inflated Type I error rate, the Bonferroni adjustment technique was used to determine significance. All items deemed to have significant differences were followed by post hoc Scheffe' analyses to determine significance.

## **V. FINDINGS and CONCLUSIONS**

Several findings should be noted as related to the two quantitative research questions investigating the frequency and educator self-efficacy regarding educator

requirements for students to use 21<sup>st</sup> century skills, and levels of inquiry in teachers' elementary and secondary classrooms. Educator preparation programs in elementary and secondary education and content area expertise in *STEM*, *Humanities*, or *Social and Vocational Supports* were investigated for differences.

1. Overall response rates were respectable for obtaining frequency data regarding use of 21<sup>st</sup> century skills but dropped when questions related to educator confidence with those skills were introduced.

In asking, *Are there differences across content areas with respect to frequency, level of inquiry, and self-efficacy in implementing instructional practices that employ 21<sup>st</sup> century skills in the classroom?*

2. *Social and Vocational Supports* teachers reported greater frequencies of requiring 21<sup>st</sup> century skills to be used by their students than teachers in *STEM* content areas, with teachers of *Humanities* reporting the lowest frequencies.
3. No significant differences were noted in the domain of *Communication* across all categories assessed with frequency rates at only once per week.
4. The highest levels of abstract thinking and creative innovation at *DOK 4* indicated no significant differences for all educators regardless of preparation program or content area.

For the second research question *Are there differences in teachers' self-efficacy for teaching content through inquiry with 21<sup>st</sup> century skills for the following levels of educators' preparation program: elementary, secondary, and both levels, or elementary and secondary?* minimal differences were noted.



5. Overall responses remained near the level of 3 on the 5-point Likert scale. No significant differences were obtained across any content areas.
6. Only minimal differences were noted by educator preparation criteria with items requiring technology use to yield greater confidence with secondary prepared educators.
7. Elementary prepared educators showed significant differences in requiring use of lower level *DOK 1* skills more often than secondary trained colleagues.
8. Although statistical differences were not noted with much of the data, it is evident that self-efficacy ratings related to classroom practices dropped as the depth of knowledge levels of tasks increased such that the greatest self-efficacy levels are reported at the lower DOK levels.
9. Overall frequencies were reported at one time per week for use of the variety of 21<sup>st</sup> century skills in classrooms.

The quantitative findings highlight areas of interest and potential concern. The differences in responses, or lack of them, certainly serve to highlight areas of focus.

## **VII. EDUCATIONAL IMPLICATIONS**

**Interpretation of Major Findings.** It is evident from the results of this study that there are differences across teacher preparation programs and content areas of specialization in relation to frequencies of classroom practices regarding the mastery of 21<sup>st</sup> century skills used by students. Findings indicate that the differences in teacher preparation practices by level do matter and there is an ongoing need to ensure practitioners are afforded strategic opportunities to develop professionally and remain proficient with the ever-changing skills and knowledge required for

students to remain competitive in the workplace (Bellanca & Brandt, 2010; Boyles, 2012; Darling-Hammond, Barron, Pearson, Schoenfeld, Stage, Zimmerman, Cervetti, & Tilson, 2008; Greenstein, 2012; Griffin, McGaw, & Care, 2012; Hilton, 2008; Juke, McCain, & Crockett, 2010; Presseisen, 2008; Wagner, 2012).

Supportive leadership is needed to manage changes necessary to maintain progressive classrooms that adequately prepare students for multicultural, global opportunities (Berlin & White, 2009; Binko & Lawlor, 1986; Dick, Eick, & Brantley-Dias, 2010; Gallagher & Bailey, 2000; Messer, 2010; Weiner, 2002).

No significant differences were noted regarding self-efficacy across teacher preparation programs and content areas of specialization. Measurements in these areas resulted in reported midpoint values across most items. The lack of range in responses was most likely linked to the fears participants experienced when unsure with content they were expected to teach (Bandura, 1993; Dykeman, Wood, Ingram, & Herr, 2003; Fall & McLeod, 2001; Goddard, Hoy, & Hoy, 2004; Hoy & Spero, 2005; Jenson, Petri, Day, Truman, & Duffy, 2011; Schunk, 2003). Response rates decreased for items related to self-efficacy, which served as further evidence of the reservations educators might have had in admitting they are not experts in a content area and may personally and professionally benefit from additional educational opportunities (Goddard, Hoy, & Hoy, 2000; Skaalvik & Skaalvik, 2010; Tschannen-Moran, Woolfolk, Hoy, & Hoy, 1998). These findings relate well to previous studies which attributed self-efficacy to individual motivation towards actualizing personal goals, was related to individual behaviors, personal actions, and environmental conditions (Dykeman, Wood, Ingram, & Herr, 2003; Goddard, Hoy, & Hoy, 2004)

and improved with experience (Oztas & Dilmac, 2009). Individuals with low self-efficacy were hesitant to initiate and complete tasks (Bardi & Schwartz, 2003).

**Recommendations for Policy and Practice.** In the words of Malcolm Gladwell (2008, p.42), “Practice isn't the thing you do once you're good. It's the thing you do that makes you good.”

1. Data supporting overall deficiencies in teacher self-efficacy in relation to utilization of 21<sup>st</sup> century skills in the classroom were evident, suggesting this should be an area of focus for future studies and is worthy of attention when planning professional development opportunities and instituting new school-wide initiatives.
2. It is critical for educational leaders to set direction and communicate a clear, consistent vision to all stakeholders for any sustainable change to be realized (Leithwood, Harris, & Strauss, 2010). In order to do so effectively, those leaders must take the time to understand the needs and competencies of those they are charged to lead (DuFour, DuFour, Eaker, & Many, 2012). The quantitative items can provide a valid and reliable measure to conduct such an assessment.

In evaluating the frequency of 21<sup>st</sup> century skills in use in the classroom, findings suggest much work is to be done school-wide in ensuring skills are in use and are practiced at daily intervals.

3. Strategic planning to focus on high-level student needs in areas where educators may have greater levels of self-efficacy would be an ideal starting point.

Professional development opportunities must be made available and encouraged for all educators to ensure adequate levels of teacher confidence in requiring their

students to practice 21<sup>st</sup> century skills on a daily basis (Dalziel & Schoonover, 1988; Gainey & Webb, 1998; Leithwood, Harris, & Strauss, 2010; Sternberg, 2008).

4. It is important for educators to realize the exponential rates at which knowledge grows on a continual basis. It is virtually impossible for one individual to constantly know all that has been uncovered on a given topic. With this perspective in the forefront of each educator's work, it will become increasingly clear that a shift needs to occur from the development of sheer knowledge towards the mastery of 21<sup>st</sup> century skills (Bellanca & Brandt, 2010; Berrett, 2012; Guskey, 2008; Jukes, McCain, & Crockett, 2010; Marshall, Horton, & White, 2009; Marzano, 2009; Wagner, 2012). A successful future clearly rests with a resourceful, skill-based workforce that begins in K-12 classrooms.
5. The findings of this work and the utility of the survey instrument should be shared with higher education professionals that direct and develop educator preparation programs, leaders in state departments of education, and district level professional development personnel in order to propagate its findings and expand applications that promote improvements and lead to the necessary transformations in the field.

**Recommendations for Further Study.** It is evident that the quantitative survey items developed for the purposes of this study resulted in an instrument that may have utility for additional applications. Alpha reliabilities were greater than .7 at the item level and .8 at the domain level in most cases.

This study explored the frequency of 21<sup>st</sup> century skills used in urban and urban ring classrooms to assess differences in utilization based on educator preparation

and content areas of educator specialization. The literature and study findings suggest there are differences in classroom practices with respect to both variables.

Overall findings revealed frequencies of 21<sup>st</sup> century skills utilization in the classroom at one time per week for best-case employment. This frequency will not afford students ample opportunities to practice these skills and maintain proficiencies if school-wide implementation does not take place across all K-12 grade levels. Frequent repetition, with reasonable time on task and dedicated practice will lead to mastery of skills (Gladwell, 2008; Ripley, 2013). In order for students to reach mastery with 21<sup>st</sup> century skills, it is apparent from this work that teachers must first have opportunities to build their own comfort levels and gain proficiency with these skills. Ongoing professional development opportunities and opportunities presented to new practitioners in their teacher preparation programs are imperative for this to be realized. Higher education opportunities must be redesigned to ensure teachers are adequately trained to develop the necessary 21<sup>st</sup> century skills within the students in their classrooms.

Although research studies are limited regarding frequency and level of inquiry in practice with 21<sup>st</sup> century skills in classroom settings, the findings of this study demonstrate the importance of quantifying how often and which specific skills students are practicing at routine intervals. It is imperative that a common vision be refined to enable 21<sup>st</sup> century skills to be realized, as a field comprised of necessary, clearly defined skills with a unified identity. Many educators state they are requiring 21<sup>st</sup> century skills to be practiced by their students, and understand their importance on a surface level, but when quantified, the low frequencies of practice are

astonishing. The survey developed and utilized for this study, serves as an adequate tool to measure and guide the field in practices and confidence needed to attain desired outcomes for proficient, 21<sup>st</sup> century learners. Additional work must be conducted to create a clear, common vision that educators can own and practice with fidelity such that their students can reach mastery with 21<sup>st</sup> century skills at the highest levels of inquiry practice that promote critical thinking, problem solving and creative innovations needed in the 21<sup>st</sup> century workplace.

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## APPENDIX A

Table 1

*Quantitative Data Collection Response Rates (N=175)*

Location	Response Rates			
	1 <sup>st</sup> email	2 <sup>nd</sup> email	3 <sup>rd</sup> email	Total
1	13%	5%	8%	26%
2	14%	2%	0%	16%
3	13%	0%	0%	13%
4	12%	12%	12%	36%
5	14%	17%	0%	31%
6	26%	3%	13%	42%
7	15%	4%	0%	19%
8	18%	4%	0%	21%
9	50%	3%	0%	53%
10	11%	5%	1%	17%
11	22%	29%	0%	51%
12	5%	11%	0%	16%
District 1	15%	15%	3%	33%
District 2	16%	6%	1%	23%
Overall	15%	10%	2%	27%

Table 2

*Comparison of Groups of Schools by Grade Level*

	<u>Elementary</u>		<u>Secondary</u>	
	<i>N</i>	%	<i>N</i>	%
All Schools K – 12	249	39	390	61
Questionnaire Respondents	73	42	102	58
Focus Group Participants	3	38	5	63

*Note.* All schools K -12 refers to the data compiled from Rhode Island Department of Education (2013).

Table 3

*Literature-derived Item Sets for Potential 21<sup>st</sup> Century Skills Content Domains Regarding Frequency*

Item Stem
<p><b>21<sup>st</sup> Century Skills Literature-derived set: Research (N=172 , <math>\alpha</math> = .81 )</b></p> <p><i>How often in the school year, do you require your students to:</i></p> <p>locate their own information on an instructional topic from books? (1a)</p> <p>locate their own information on an instructional topic from electronic resources? (1b)</p> <p>interpret, analyze or evaluate information on an instructional topic? (1c)</p> <p>synthesize information on an instructional topic using multiple resources? (1d)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Cognition (N=171 , <math>\alpha</math> = .81 )</b></p> <p><i>How often in the school year, do you require your students to:</i></p> <p>visualize information on an instructional topic? (1e)</p> <p>use imagination to explain an instructional topic? (1f)</p> <p>find solutions to multistep problems? (1g)</p> <p>think critically and apply thinking to find a creative solution to a challenge? (1h)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Communication (N=171, <math>\alpha</math> = .81 )</b></p> <p><i>How often in the school year, do you require your students to:</i></p> <p>present information on an instructional topic? (1i)</p> <p>collaborate and work in instructional groups? (1j)</p> <p>engage in evidence-based discussions? (1k)</p> <p>support claims with evidence through written or verbal communication? (1l)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Civic Contribution (N=169 , <math>\alpha</math> = .72 )</b></p> <p><i>How often in the school year, do you require your students to:</i></p> <p>use skills and knowledge to find solutions to school and community issues? (1m)</p> <p>adapt and adjust to unexpected changes to solve non-routine problems? (1n)</p> <p>practice entrepreneurship or create a product from a concept they developed?(1o)</p>
<p><i>Note: Rating scale associate with all item was 1=Never; 2=Once a Year;</i></p> <p><i>3=Once a Month; 4=Once a Week; 5=Daily</i></p>

Table 4

*Literature-derived Item Sets for Potential Depth of Knowledge Content Domains Regarding Frequency*

Item Stem
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**Depth of Knowledge Literature-derived set: DOK 1 (N=161 ,  $\alpha$  = .68 )**

*How often in the school year, do you require your students to:*

draw, illustrate, and/or label a diagram? (2a)

identify, define, recite, quote, recognize, recall or memorize concepts? (2b)

calculate, measure, tabulate, arrange or match items or data? (2c)

**Depth of Knowledge Literature-derived set: DOK 2 (N=162 ,  $\alpha$  = .70 )**

*How often in the school year, do you require your students to:*

infer, predict, observe, interpret, use context clues, estimate, or identify patterns? (2d)

categorize, classify, compare, organize, distinguish, or summarize ideas or data? (2e)

graph, construct or modify data or results? (2f)

**Depth of Knowledge Literature-derived set: DOK 3 (N=160 ,  $\alpha$  = .80 )**

*How often in the school year, do you require your students to:*

assess, investigate, or compare information or data? (2g)

develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions?(2h)

use concepts to solve non-routine problems or explain phenomena? 2i)

**Depth of Knowledge Literature-derived set: DOK 4 (N=159 ,  $\alpha$  = .85 )**

*How often in the school year, do you require your students to:*

design or create a model to illustrate an idea? (2j)

connect, synthesize or apply concepts to deepen understandings? (2k)

critique, prove or analyze to solve problems or understand abstract concepts? (2l)

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*Note:* Rating scale associate with all item was 1=Never; 2=Once a Year;

3=Once a Month; 4=Once a Week; 5=Daily

Table 5

*Literature-derived Item Sets for Potential 21<sup>st</sup> Century Skills Content Domains Regarding Self-efficacy*

Item Stem
<p><b>21<sup>st</sup> Century Skills Literature-derived set: Research (N=150 , <math>\alpha</math> = .89 )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>locate their own information on an instructional topic from books? (3a)</p> <p>locate their own information on an instructional topic from electronic resources? (3b)</p> <p>interpret, analyze or evaluate information on an instructional topic? (3c)</p> <p>synthesize information on an instructional topic using multiple resources? (3d)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Cognition (N=150 , <math>\alpha</math> = .89 )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>visualize information on an instructional topic? (3e)</p> <p>use imagination to explain an instructional topic? (3f)</p> <p>find solutions to multistep problems? (3g)</p> <p>think critically and apply thinking to find a creative solution to a challenge? (3h)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Communication (N=150 , <math>\alpha</math> = .90 )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>present information on an instructional topic? (3i)</p> <p>collaborate and work in instructional groups? (3j)</p> <p>engage in evidence-based discussions? (3k)</p> <p>support claims with evidence through written or verbal communication? (3l)</p> <p><b>21<sup>st</sup> Century Skills Literature-derived set: Civic Contribution (N=147 , <math>\alpha</math> = .85 )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>use skills and knowledge to find solutions to school and community issues? (3m)</p> <p>adapt and adjust to unexpected changes to solve non-routine problems? (3n)</p> <p>practice entrepreneurship or create a product from a concept they developed?(3o)</p>
<p><i>Note:</i> The response format used an endpoint Likert scale as follows:</p> <p>1 = Not Very Confident; 5 = Very Confident.</p>



Table 6

*Literature-derived Item Sets for Potential Depth of Knowledge Content Domains Regarding Self-efficacy*

Item Stem
<p><b>Depth of Knowledge Literature-derived set: DOK 1 (<math>N=147</math> , <math>\alpha = .82</math> )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>draw, illustrate, and/or label a diagram? (4a)</p> <p>identify, define, recite, quote, recognize, recall or memorize concepts? (4b)</p> <p>calculate, measure, tabulate, arrange or match items or data? (4c)</p>
<p><b>Depth of Knowledge Literature-derived set: DOK 2 (<math>N=147</math> , <math>\alpha = 0.82</math> )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>infer, predict, observe, interpret, use context clues, estimate, or identify patterns? (4d)</p> <p>categorize, classify, compare, organize, distinguish, or summarize ideas or data? (4e)</p> <p>graph, construct or modify data or results? (4f)</p>
<p><b>Depth of Knowledge Literature-derived set: DOK 3 (<math>N=147</math> , <math>\alpha = .89</math> )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>assess, investigate, or compare information or data? (4g)</p> <p>develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions?(4h)</p> <p>use concepts to solve non-routine problems or explain phenomena? 4i)</p>
<p><b>Depth of Knowledge Literature-derived set: DOK 4 (<math>N=146</math> , <math>\alpha = .92</math> )</b></p> <p><i>How confident are you in requiring your students to:</i></p> <p>design or create a model to illustrate an idea? (4j)</p> <p>connect, synthesize or apply concepts to deepen understandings? (4k)</p> <p>critique, prove or analyze to solve problems or understand abstract concepts? (4l)</p>
<p><i>Note:</i> The response format used an endpoint Likert scale as follows:</p> <p>1 = Not Very Confident; 5 = Very Confident.</p>

Table 7

*Construct Validity of Major Questionnaire Components*

Component	Support for component	Items	Origin
21 <sup>st</sup> Century Skills	Binkley et al. (2013), Donn et al. (2013), Griffin et al. (2012), King et al. (2013), Koenig (2011), Kuhlthau et al. (2007), Rosefsky & Opfer (2012), Yarnall (2011)	1a-1o, 3a-3o	Researcher -adapted from Kuhlthau et al. (2007)
Inquiry Levels	Webb (1997a), Webb (1997b), Webb (2002), Webb et al. (2006), Webb (2009)	2a-2l, 4a-4l	Researcher -adapted from Webb (2006)
Self-Efficacy	Bandura (1977a), Bandura (1977b), Bandura (1982a), Bandura (1982b), Bandura (1986), Bandura (1989a), Bandura (1989b), Bandura (1993), Bandura (1997), Bandura (2001), Bandura (2006), Bandura (2013), Bandura et al. (1996), Bandura et al. (1980), Bandura & Locke (2003)	3a-3o, 4a-4l	Researcher -adapted from Kuhlthau et al. (2007) and Webb (2006)
Response scales	McCoach et al. (2013)	All	McCoach et al. (2013)

Table 8

21<sup>st</sup> Century Skills Assessment: Item Analysis and Reliability of Frequency Data (N=175)

Dimension/Item	Response Percentages <sup>1</sup>					Mean	Standard Deviation	Correlation with Dimension	Dimension Alpha Reliability If Item Deleted	Dimension Alpha Reliability
	1	2	3	4	5					
<b>Research</b>										
Locate own information from books (1a)	11	9	25	30	25	3.50	1.25	.58	.79	<b>.81</b>
Locate own information from electronic resources (1b)	12	8	40	27	13	3.20	1.15	.62	.77	
Interpret, analyze, evaluate information (1c)	5	5	14	33	42	4.02	1.12	.64	.76	
Synthesize information from multiple resources (1d)	9	11	28	33	19	3.43	1.18	.69	.74	
<b>Cognition</b>										
Visualize information (1e)	3	2	18	33	44	4.13	0.98	.65	.75	<b>.81</b>
Share curiosity or use imagination (1f)	6	6	17	33	38	3.91	1.15	.55	.80	
Find solutions to multistep problems (1g)	4	1	14	28	53	4.25	0.99	.63	.76	
Think critically and apply thinking to a creative solution (h)	2	5	17	26	50	4.16	1.03	.68	.74	
<b>Communication</b>										
Present information (1i)	4	8	28	24	36	3.81	1.12	.52	.81	<b>.81</b>
Collaborate and work in instructional groups (1j)	1	1	11	30	57	4.41	0.82	.62	.77	
Engage in evidence-based discussions (1k)	4	4	14	39	40	4.08	1.01	.66	.74	
Support claims with written or verbal evidence (1l)	4	3	16	27	51	4.19	1.03	.72	.71	
<b>Civic Contribution</b>										
Use skills and knowledge to find solutions to school and community issues (1m)	11	23	29	21	16	3.08	1.23	.58	.59	<b>.72</b>
Adapt and adjust to unexpected changes to solve non-routine problems (1n)	7	10	24	22	38	3.76	1.24	.55	.62	
Practice entrepreneurship or create a product from a developed concept (1o)	52	21	15	7	4.7	1.91	1.17	.50	.69	

<sup>1</sup> Rating Scale: 1=Never; 2=Once a Year; 3=Once a Month; 4=Once a Week; 5=Daily

Table 9

21<sup>st</sup> Century Skills Assessment: Item Analysis and Reliability of Inquiry Level Data (N=175)

Dimension/Item	Response Percentages <sup>1</sup>					Mean	Standard Deviation	Correlation with Dimension	Dimension Alpha Reliability If Item Deleted	Dimension Alpha Reliability
	1	2	3	4	5					
Depth of Knowledge 1 (DOK 1)										
Draw, illustrate, label a diagram (2a)	3	6	25	40	26	3.81	0.99	.50	.59	.68
Identify, define, recite, quote, recognize, recall or memorize concepts (2b)	3	1	12	34	50	4.25	0.94	.46	.64	
Calculate, measure, tabulate, arrange or match items or data (2c)	10	8	14	33	35	3.76	1.29	.56	.51	
Depth of Knowledge 2 (DOK 2)										
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (2d)	3	1	10	28	58	4.37	0.94	.58	.55	.70
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (2e)	1	2	13	28	56	4.35	0.87	.59	.55	
Graph, construct or modify data or results (2f)	15	11	25	29	21	3.29	1.32	.45	.77	
Depth of Knowledge 3 (DOK 3)										
Assess, investigate, or compare information or data (2g)	6	4	27	34	29	3.77	1.09	.64	.73	.80
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (2h)	4	3	29	33	31	3.83	1.04	.68	.69	
Use concepts to solve non-routine problems or explain phenomena (2i)	16	12	27	28	18	3.21	1.31	.63	.76	
Depth of Knowledge 4 (DOK 4)										
Design or create a model to illustrate an idea (2j)	15	15	31	27	13	3.1	1.23	.67	.85	.85
Connect, synthesize or apply concepts to deepen understandings (2k)	4	8	20	35	33	3.86	1.09	.77	.76	
Critique, prove or analyze to solve problems or understand abstract concepts (2l)	8	6	25	33	28	3.67	1.17	.75	.78	

<sup>1</sup> Rating Scale: 1=Never; 2=Once a Year; 3=Once a Month; 4=Once a Week; 5=Daily

Table 10

21<sup>st</sup> Century Skills Assessment: Item Analysis and Reliability of Self Efficacy with Frequency Data (N=175)

Dimension/Item	Response Percentages <sup>1</sup>					Mean	Standard Deviation	Correlation with Dimension	Dimension Alpha Reliability If Item Deleted	Dimension Alpha Reliability
	1	2	3	4	5					
<b>Research</b>										<b>.89</b>
Locate own information from books (3a)	7	10	31	21	31	3.57	1.23	.71	.88	
Locate own information from electronic resources (3b)	9	9	31	27	25	3.52	1.21	.72	.87	
Interpret, analyze, evaluate information (3c)	3	12	36	28	21	3.52	1.04	.82	.83	
Synthesize information from multiple resources (3d)	7	14	36	26	18	3.34	1.13	.79	.85	
<b>Cognition</b>										<b>.89</b>
Visualize information (3e)	2	8	29	40	21	3.70	0.96	.79	.85	
Share curiosity or use imagination (3f)	4	10	31	35	20	3.57	1.04	.70	.89	
Find solutions to multistep problems (3g)	2	14	26	34	25	3.66	1.06	.77	.86	
Think critically and apply thinking to a creative solution (3h)	1	18	24	35	22	3.57	1.06	.81	.85	
<b>Communication</b>										<b>.90</b>
Present information (3i)	1	5	27	35	32	3.92	0.95	.75	.88	
Collaborate and work in instructional groups (3j)	3	1	18	34	44	4.15	0.94	.75	.89	
Engage in evidence-based discussions (3k)	3	7	29	34	27	3.75	1.02	.80	.86	
Support claims with written or verbal evidence (3l)	3	6	26	35	31	3.85	1.02	.82	.86	
<b>Civic Contribution</b>										<b>.85</b>
Use skills and knowledge to find solutions to school and community issues (3m)	5	22	35	20	18	3.22	1.14	.76	.76	
Adapt and adjust to unexpected changes to solve non-routine problems (3n)	5	16	29	30	20	3.42	1.14	.73	.79	
Practice entrepreneurship or create a product from a developed concept (3o)	26	24	24	21	6	2.55	1.23	.68	.84	

<sup>1</sup> Rating Scale: 1=Never; 2=Once a Year; 3=Once a Month; 4=Once a Week; 5=Daily

Table 11

21<sup>st</sup> Century Skills Assessment: Item Analysis and Reliability of Self Efficacy with Inquiry Level Data (N=175)

Dimension/Item	Response Percentages <sup>1</sup>					Mean	Standard Deviation	Correlation with Dimension	Dimension Alpha Reliability If Item Deleted	Dimension Alpha Reliability
	1	2	3	4	5					
Depth of Knowledge 1 (DOK 1)										
Draw, illustrate, label a diagram (4a)	2	3	15	32	48	4.21	.95	.69	.74	.82
Identify, define, recite, quote, recognize, recall or memorize concepts (4b)	1	5	13	43	38	4.13	.88	.66	.78	
Calculate, measure, tabulate, arrange or match items or data (4c)	4	10	26	33	26	3.67	1.10	.71	.73	
Depth of Knowledge 2 (DOK 2)										
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (4d)	1	4	25	40	30	3.93	.91	.73	.72	.82
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (4e)	1	7	24	39	29	3.88	.96	.72	.72	
Graph, construct or modify data or results (4f)	9	12	26	32	20	3.42	1.20	.62	.85	
Depth of Knowledge 3 (DOK 3)										
Assess, investigate, or compare information or data (4g)	4	12	26	36	22	3.59	1.08	.80	.84	.89
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (4h)	6	12	32	32	18	3.45	1.10	.83	.81	
Use concepts to solve non-routine problems or explain phenomena (4i)	8	15	37	28	12	3.20	1.09	.74	.89	
Depth of Knowledge 4 (DOK 4)										
Design or create a model to illustrate an idea (4j)	8	10	37	27	17	3.34	1.13	.75	.94	.92
Connect, synthesize or apply concepts to deepen understandings (4k)	7	12	36	29	16	3.35	1.10	.87	.85	
Critique, prove or analyze to solve problems or understand abstract concepts (4l)	8	16	34	29	14	3.26	1.12	.87	.84	

<sup>1</sup> Rating Scale: 1=Never; 2=Once a Year; 3=Once a Month; 4=Once a Week; 5=Daily

Table 12

ANOVA Summary for the Differences Across Content Areas with Respect to Frequency of 21<sup>st</sup> Century Skills Applications Employed in Classrooms (N=139)

To what extent is there a difference across content areas with respect to frequency of inquiry practice in the classroom:	Social and Vocational						Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Supports (n = 38)		STEM (n = 31)		
	M	SD	M	SD	M	SD	
<b>Research</b>							
Locate own information from books (1a)	3.49	.90	3.84	.84	3.48	.97	2.12 .124 NSD
Locate own information from electronic resources (1b)**	3.65	1.17	3.68	1.17	3.14	1.22	2.27 .107 NSD
Interpret, analyze, evaluate information (1c)	3.06	1.12	3.79	.96	3.38	1.02	5.99 .003 STEM > Humanities STEM < SV Supports
Synthesize information from multiple resources (1d)	3.99	1.10	4.11	1.01	3.87	1.31	.38 .683 NSD
<b>Cognition</b>							
Visualize information (1e)	3.30	1.15	3.79	1.12	3.48	1.18	2.24 .110 NSD
Share curiosity or use imagination (1f)	3.96	.93	4.52	.53	3.99	.72	6.68 .002 STEM < SV Supports
Find solutions to multistep problems (1g)**	3.97	1.08	4.47	.65	4.10	.80	3.71 .027 NSD
Think critically and apply thinking to a creative solution (1h)**	4.07	1.00	4.18	1.09	3.48	1.27	3.97 .021 NSD
	3.88	1.17	4.79	.47	4.37	.81	11.61 .000 STEM > Humanities STEM < SV Supports
	3.89	1.21	4.63	.54	4.03	.96	6.81 .002 STEM > Humanities STEM < SV Supports
(continued)							

(continued)

Table 12 ANOVA Summary for the Differences Across Content Areas with Respect to Frequency of 21st Century Skills Employed in Classrooms (N=139)  
(continued)

To what extent is there a difference across content areas with respect to frequency of inquiry practice in the classroom:	Social and Vocational										Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Supports (n = 38)		STEM (n = 31)		F	p	η <sup>2</sup>		
	M	SD	M	SD	M	SD					
Communication	4.05	.82	4.34	.51	3.98	.75	2.61	.077		NSD	
Present information (1i)	3.71	1.13	4.16	.95	3.59	1.11	2.87	.060		NSD	
Collaborate and work in instructional groups (1j)	4.3	.86	4.58	.60	4.33	.71	1.73	.181		NSD	
Engage in evidence-based discussions (1k)	4.07	1.02	4.39	.64	3.83	.99	3.22	.043		NSD	
Support claims with written or verbal evidence (1l)	4.16	1.06	4.24	.88	4.1	.89	.17	.843		NSD	
Civic Contribution	2.74	1.01	3.57	.81	2.59	.85	12.56	.000		STEM < SV Supports	
Use skills and knowledge to find solutions to school and community issues (1m)**	2.88	1.2	3.95	1.09	2.57	1.04	15.17	.000	.19*	STEM < Humanities STEM < SV Supports	
Adapt and adjust to unexpected changes to solve non-routine problems (1n)**	3.43	1.35	4.41	.87	3.52	1.21	8.43	.000	.11*	STEM > Humanities STEM < SV Supports	
Practice entrepreneurship or create a product from a developed concept (1o)	1.89	1.16	2.3	1.29	1.72	1.10	2.21	.113		NSD	

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .003$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format was as follows: 1 = *Never*; 2 = *Once a Year*; 3 = *Once a Month*; 4 = *Once a Week*; 5 = *Daily*.



Table 13

ANOVA Summary for the Differences Across Content Areas with Respect to Level of Inquiry of 21<sup>st</sup> Century Skills Employed in Classrooms (N=138)

To what extent is there a difference across content areas with respect to level of inquiry practice in the classroom:	Social and Vocational						Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Supports (n = 37)		STEM (n = 31)		
	M	SD	M	SD	M	SD	
<b>Depth of Knowledge 1 (DOK 1)</b>							
Draw, illustrate, label a diagram (2a)**	3.66	.92	4.22	.81	4.12	.68	6.68 .002
Identify, define, recite, quote, recognize, recall or memorize concepts (2b)	3.46	1.06	4.19	.91	4.10	.87	8.62 .000
Calculate, measure, tabulate, arrange or match items or data (2c)**	4.25	1.04	4.27	1.05	4.07	.83	.42 .656
	3.31	1.43	4.22	1.13	4.17	.75	8.66 .000
<b>Depth of Knowledge 2 (DOK 2)</b>							
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (2d)	3.79	.80	4.28	.85	4.17	.71	5.47 .005
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (2e)	4.41	.89	4.41	1.01	4.26	.73	.35 .702
Graph, construct or modify data or results (2f)**	4.19	.95	4.65	.59	4.27	.74	3.93 .022
	2.77	1.33	3.75	1.34	3.93	.91	12.37 .000
<b>Depth of Knowledge 3 (DOK 3)</b>							
Assess, investigate, or compare information or data (2g)**	3.37	1.00	3.93	.83	3.76	.89	4.91 .009
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (2h)	3.53	1.15	4.16	.90	4.07	.74	5.79 .004
Use concepts to solve non-routine problems or explain phenomena (2i)	3.73	1.10	3.97	.90	3.86	.88	.74 .478
	2.86	1.37	3.65	1.03	3.40	1.33	5.18 .007

(continued)

(continued)

Table 13 ANOVA Summary for the Differences Across Content Areas with Respect to Level of Inquiry of 21st Century Skills Employed in Classrooms (N=138)  
(continued)

To what extent is there a difference across content areas with respect to level of inquiry practice in the classroom:	Social and Vocational						F	p	$\eta^2$	Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Vocational Supports (n = 37)		STEM (n = 31)					
	M	SD	M	SD	M	SD				
<b>Depth of Knowledge 4 (DOK 4)</b>	3.4	1.06	3.7	1.01	3.65	0.89	1.31	.275		NSD
Design or create a model to illustrate an idea (2j)	2.93	1.26	3.41	1.09	3.28	1.19	2.16	.120		NSD
Connect, synthesize or apply concepts to deepen understandings (2k)	3.74	1.15	3.95	1.08	3.90	.94	.51	.604		NSD
Critique, prove or analyze to solve problems or understand abstract concepts (2l)	3.58	1.19	3.76	1.26	3.82	.95	.55	.579		NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .003$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format was as follows: 1 = Never; 2 = Once a Year; 3 = Once a Month; 4 = Once a Week; 5 = Daily.

Table 14

ANOVA Summary for the Differences in Teacher Self-Efficacy Across Content Areas with Respect to 21<sup>st</sup> Century Skills Employed in Classrooms (N=137)

To what extent is there a difference in teacher self-efficacy across content areas with respect to inquiry practice in the classroom:	Social and Vocational Supports										Summary of Significant Differences <sup>1</sup>	
	Humanities		STEM									
	M	SD	M	SD	M	SD	M	SD	F	p		η <sup>2</sup>
<b>Research</b>												
Locate own information from books (3a)	3.57	1.04	3.47	1.00	3.41	.87			.30	.743		NSD
Locate own information from electronic resources (3b)	3.77	1.20	3.46	1.19	3.30	1.29			1.8	.171		NSD
Interpret, analyze, evaluate information (3c)	3.50	1.26	3.65	1.09	3.67	1.06			.31	.736		NSD
Synthesize information from multiple resources (3d)	3.64	1.06	3.54	.98	3.43	.90			.47	.625		NSD
<b>Cognition</b>												
Visualize information (3e)	3.39	1.17	3.38	1.09	3.23	1.04			.21	.811		NSD
Share curiosity or use imagination (3f)	3.69	.86	3.59	1.03	3.54	.80			.37	.693		NSD
Find solutions to multistep problems (3g)	3.73	.98	3.70	1.08	3.60	.81			.19	.831		NSD
Think critically and apply thinking to a creative solution (3h)	3.76	.89	3.59	1.04	3.17	1.23			3.56	.031		NSD
	3.66	1.02	3.54	1.15	3.90	.98			.96	.385		NSD
	3.64	1.10	3.51	1.07	3.55	.99			.18	.835		NSD
												(continued)

(continued)

Table 14 ANOVA Summary for the Differences in Teacher Self-Efficacy Across Content Areas with Respect to 21st Century Skills Employed in Classrooms (N=137)  
(continued)

To what extent is there a difference in teacher self-efficacy across content areas with respect to inquiry practice in the classroom:	Social and Vocational Supports										Summary of Significant Differences <sup>1</sup>	
	Humanities (n = 70)				STEM (n = 30)				F	p		$\eta^2$
	Vocational Supports (n = 37)		STEM (n = 30)									
	M	SD	M	SD								
<b>Communication</b>												
Present information (3i)	4.00	.82	3.78	0.91	3.90	.67	.89	.412			NSD	
Collaborate and work in instructional groups (3j)	4.03	.94	3.76	0.96	3.90	.77	1.1	.337			NSD	
Engage in evidence-based discussions (3k)	4.24	.89	4.00	.94	4.20	.81	.93	.397			NSD	
Support claims with written or verbal evidence (3l)	3.84	.96	3.68	1.03	3.62	1.02	.66	.518			NSD	
	3.91	1.03	3.70	1.08	3.90	.77	.58	.560			NSD	
<b>Civic Contribution</b>												
Use skills and knowledge to find solutions to school and community issues (3m)	3.08	1.08	3.21	1.08	2.79	.93	1.31	.273			NSD	
Adapt and adjust to unexpected changes to solve non-routine problems (3n)	3.31	1.18	3.32	1.18	2.86	1.03	1.77	.174			NSD	
Practice entrepreneurship or create a product from a developed concept (3o)	3.39	1.16	3.47	1.08	3.28	1.19	.24	.790			NSD	
	2.63	1.23	2.84	1.21	2.24	1.21	1.97	.144			NSD	

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .004$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format used an endpoint Likert scale as follows: 1 = Not Very Confident; 5 = Very Confident.

Table 15

ANOVA Summary for the Differences in Teacher Self-Efficacy Across Content Areas with Respect to Levels of Inquiry Employed in Classrooms (N=137)

To what extent is there a difference in teacher self-efficacy across content areas with respect to the level of inquiry practice in the classroom:	Social and Vocational										Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Supports (n = 37)		STEM (n = 30)		F	p	η <sup>2</sup>		
	M	SD	M	SD	M	SD					
<b>Depth of Knowledge 1 (DOK 1)</b>											
Draw, illustrate, label a diagram (4a)	3.90	.89	4.01	.84	4.23	.60	1.76	.177			NSD
	4.14	1.00	4.22	.98	4.40	.68	.80	.451			NSD
Identify, define, recite, quote, recognize, recall or memorize concepts (4b)	4.11	.99	4.03	.87	4.20	.61	.32	.728			NSD
Calculate, measure, tabulate, arrange or match items or data (4c)**	3.42	1.18	3.78	1.03	4.10	.76	4.48	.013			NSD
<b>Depth of Knowledge 2 (DOK 2)</b>											
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (4d)	3.66	.86	3.71	.95	3.99	.77	1.53	.220			NSD
	3.93	.91	3.81	.97	4.03	.81	.51	.602			NSD
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (4e)	3.90	.95	3.92	.98	3.97	.77	.06	.942			NSD
Graph, construct or modify data or results (4f)**	3.18	1.14	3.41	1.28	3.97	1.03	4.79	.010			NSD
<b>Depth of Knowledge 3 (DOK 3)</b>											
Assess, investigate, or compare information or data (4g)	3.35	1.00	3.52	.95	3.53	.91	.53	.589			NSD
	3.52	1.13	3.68	.97	3.67	1.06	.33	.719			NSD
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (4h)	3.42	1.14	3.54	1.02	3.63	.89	.46	.632			NSD
Use concepts to solve non-routine problems or explain phenomena (4i)	3.13	1.16	3.35	1.03	3.31	.93	.61	.548			NSD
											(continued)

(continued)

Table 15 ANOVA Summary for the Differences in Teacher Self-Efficacy Across Content Areas with Respect to Levels of Inquiry Employed in Classrooms (N=137) (continued)

To what extent is there a difference in teacher self-efficacy across content areas with respect to the level of inquiry practice in the classroom:	Social and Vocational								Summary of Significant Differences <sup>1</sup>
	Humanities (n = 70)		Supports (n = 37)		STEM (n = 30)		F	p	$\eta^2$
	M	SD	M	SD	M	SD			
<b>Depth of Knowledge 4 (DOK 4)</b>									
	3.32	1.07	3.40	.98	3.32	.91	.07	.933	NSD
Design or create a model to illustrate an idea (4i)	3.31	1.20	3.49	1.12	3.34	.94	.30	.738	NSD
Connect, synthesize or apply concepts to deepen understandings (4k)	3.43	1.12	3.35	1.09	3.38	1.02	.07	.937	NSD
Critique, prove or analyze to solve problems or understand abstract concepts (4l)	3.26	1.15	3.39	.99	3.24	1.15	.20	.823	NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .004$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format used an endpoint Likert scale as follows: 1 = Not Very Confident; 5 = Very Confident.

Table 16

ANOVA Summary for the Relationship of Educator Preparation Program to Frequency of 21st Century Skills Employed in Classrooms (N=148)

In what manner does the level of an educators' preparation in classrooms:	Elementary and Secondary						F	p	$\eta^2$	Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)		Secondary (n = 63)		Secondary (n = 26)					
	M	SD	M	SD	M	SD				
<b>Research</b>										
Locate own information from books (1a)	3.31	.96	3.83	.77	3.47	1.01	5.40	.005		NSD
	3.43	1.26	3.73	1.14	3.28	1.21	1.62	.202		NSD
Locate own information from electronic resources (1b)**	2.83	1.00	3.68	1.02	3.35	1.29	9.60	.000	.12*	Sec > Elem Sec > Both Both > Elem
Interpret, analyze, evaluate information (1c)	3.75	1.27	4.22	.89	4.04	1.15	2.88	.059		NSD
	3.2	1.26	3.71	.97	3.27	1.37	3.15	.046		NSD
Synthesize information from multiple resources (1d)										
<b>Cognition</b>										
Visualize information (1e)	4.24	.84	4.10	.72	4.02	1.01	.79	.455		NSD
	4.2	.96	4.19	.84	4.00	1.17	.46	.632		NSD
Share curiosity or use imagination (1f)	4.12	1.10	3.94	1.08	3.88	1.09	.62	.54		NSD
Find solutions to multistep problems (1g)	4.43	.98	4.15	.90	4.12	1.24	1.52	.223		NSD
Think critically and apply thinking to a creative solution (1h)	4.2	1.08	4.11	1.03	4.12	1.03	.13	.876		NSD
										(continued)

(continued)

Table 16 ANOVA Summary for the Relationship of Educator Preparation Program to Frequency of 21st Century Skills Employed in Classrooms (N=148)  
(continued)

In what manner does the level of an educators' preparation classrooms:	Elementary and Secondary						F	p	η <sup>2</sup>	Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)		Secondary (n = 63)		Secondary (n = 26)					
	M	SD	M	SD	M	SD				
<b>Communication</b>										
Present information (1i)	4.09	.81	4.18	.61	4.03	1.05	.42	.661		NSD
	3.74	1.18	3.81	1.06	3.96	1.14	.33	.718		NSD
Collaborate and work in instructional groups (1j)	4.44	.79	4.33	.72	4.42	.95	.31	.738		NSD
Engage in evidence-based discussions (1k)	4.09	1.05	4.21	.68	3.85	1.35	1.27	.285		NSD
Support claims with written or verbal evidence (1l)	4.08	1.09	4.37	.77	3.85	1.26	2.78	.065		NSD
<b>Civic Contribution</b>										
Use skills and knowledge to find solutions to school and community issues (1m)	2.80	.99	2.99	.96	2.94	1.12	.56	.575		NSD
Adapt and adjust to unexpected changes to solve non-routine problems (1n)	3.00	1.19	3.16	1.22	2.96	1.46	.34	.710		NSD
Practice entrepreneurship or create a product from a developed concept (1o)	3.59	1.38	3.74	1.12	3.96	1.37	.76	.468		NSD
	1.80	1.11	2.05	1.27	1.80	.96	.83	.436		NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .003$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format was as follows: 1 = Never; 2 = Once a Year; 3 = Once a Month; 4 = Once a Week; 5 = Daily.



Table 17

ANOVA Summary for the Relationship of Educator Preparation Program to Level of Inquiry Employed in Classrooms (N=148)

In what manner does the level of an educators' preparation program relate to level of inquiry employed in classrooms:	Elementary and Secondary						F	p	η <sup>2</sup>	Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)		Secondary (n = 63)		Secondary (n = 26)					
	M	SD	M	SD	M	SD				
<b>Depth of Knowledge 1 (DOK 1)**</b>										
Draw, illustrate, label a diagram (2a)	4.21	.71	3.79	.84	3.54	.97	7.43	.001		Elem > Sec Elem >Both
Identify, define, recite, quote, recognize, recall or memorize concepts (2b)	4.12	.77	3.67	1.12	3.42	.90	5.91	.003		NSD
Calculate, measure, tabulate, arrange or match items or data (2c)	4.49	.78	4.10	.95	3.88	1.24	4.51	.013		NSD
	4.05	1.15	3.61	1.28	3.33	1.43	3.39	.036		NSD
<b>Depth of Knowledge 2 (DOK 2)</b>										
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (2d)	4.18	.68	3.99	.77	3.60	1.19	4.29	.015		NSD
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (2e)	4.59	.77	4.29	.91	4.07	1.16	3.43	.035		NSD
Graph, construct or modify data or results (2f)	4.43	.80	4.37	.70	3.88	1.31	3.78	.025		NSD
	3.47	1.10	3.33	1.40	2.67	1.49	3.29	.04		NSD
<b>Depth of Knowledge 3 (DOK 3)</b>										
Assess, investigate, or compare information or data (2g)	3.64	.96	3.70	.89	3.23	1.19	2.20	.114		NSD
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (2h)	3.86	1.06	3.92	.89	3.38	1.33	2.51	.085		NSD
Use concepts to solve non-routine problems or explain phenomena (2i)	3.83	.99	4.00	.96	3.32	1.15	4.08	.019		NSD
	3.21	1.28	3.25	1.30	2.84	1.49	.924	.399		NSD
(continued)										

(continued)

Table 17 ANOVA Summary for the Relationship of Educator Preparation Program to Level of Inquiry Employed in Classrooms (N=148)  
(continued)

In what manner does the level of an educators' preparation program relate to level of inquiry employed in classrooms:	Elementary and Secondary						Summary of Significant Differences <sup>1</sup>		
	Elementary (n = 59)		Secondary (n = 63)		Secondary (n = 26)				
	M	SD	M	SD	M	SD			
Depth of Knowledge 4 (DOK 4)	3.41	1.11	3.73	.86	3.21	1.15	2.89	.059	NSD
Design or create a model to illustrate an idea (2j)	3.07	1.26	3.31	1.05	2.54	1.47	3.46	.034	NSD
Connect, synthesize or apply concepts to deepen understandings (2k)	3.72	1.18	3.98	.94	3.73	1.15	1.00	.369	NSD
Critique, prove or analyze to solve problems or understand abstract concepts (2l)	3.48	1.16	3.94	1.04	3.31	1.35	3.68	.028	NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .004$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format was as follows: 1 = Never; 2 = Once a Year; 3 = Once a Month; 4 = Once a Week; 5 = Daily.

Table 18

ANOVA Summary for the Relationship of Educator Preparation Program to Teachers' Self-Efficacy for Teaching Content through Inquiry (N=147)

In what manner does the level of an educators' preparation program relate to teacher self-efficacy to teach content with inquiry:	Elementary and Secondary								Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)				Secondary (n = 62)				
	M	SD	M	SD	M	SD	M	SD	
<b>Research**</b>									
Locate own information from books (3a)	3.21	1.05	3.75	.86	3.30	1.10	4.84	.009	Sec > Elem Sec > Both
Locate own information from electronic resources (3b)**	3.47	1.28	3.77	1.12	3.23	1.34	1.99	.141	NSD
Interpret, analyze, evaluate information (3c)	3.08	1.26	3.90	.92	3.42	1.36	7.71	.001	Sec > Elem Sec > Both
Synthesize information from multiple resources (3d)	3.32	1.04	3.81	.92	3.19	1.13	5.04	.008	NSD
<b>Cognition</b>									
Visualize information (3e)	3.07	1.23	3.55	1.00	3.35	1.06	2.85	.061	NSD
Share curiosity or use imagination (3f)	3.60	.95	3.61	.82	3.61	0.92	.003	.997	NSD
Find solutions to multistep problems (3g)	3.61	1.03	3.77	.86	3.65	1.02	.46	.632	NSD
Think critically and apply thinking to a creative solution (3h)	3.61	1.03	3.52	1.02	3.50	1.14	.16	.853	NSD
	3.67	1.13	3.62	.99	3.65	1.09	.04	.960	NSD
	3.50	1.06	3.58	1.08	3.62	1.06	.14	.870	NSD
(continued)									

(continued)

Table 18 ANOVA Summary for the Relationship of Educator Preparation Program to Teachers' Self-Efficacy for Teaching Content through Inquiry (N=147)  
(continued)

In what manner does the level of an educators' preparation program relate to teacher self-efficacy to teach content with inquiry:	Elementary and Secondary								Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)				Secondary (n = 62)				
	M	SD	M	SD	M	SD	M	SD	
<b>Communication</b>									
Present information (3i)	3.85	.87	4.01	.76	3.75	1.04	.975	.380	NSD
	3.85	.96	3.93	.91	3.96	1.06	.176	.839	NSD
Collaborate and work in instructional groups (3j)	4.20	.98	4.13	.84	4.00	1.13	.42	.661	NSD
Engage in evidence-based discussions (3k)	3.64	1.03	3.93	.87	3.42	1.24	2.67	.073	NSD
Support claims with written or verbal evidence (3l)	3.69	1.06	4.03	.91	3.65	1.13	2.15	.121	NSD
<b>Civic Contribution</b>									
Use skills and knowledge to find solutions to school and community issues (3m)	2.81	1.01	3.16	1.03	3.21	1.01	2.27	.107	NSD
Adapt and adjust to unexpected changes to solve non-routine problems (3n)	2.92	1.10	3.38	1.11	3.40	1.16	3.15	.046	NSD
Practice entrepreneurship or create a product from a developed concept (3o)	3.23	1.20	3.49	1.12	3.54	1.03	1.05	.354	NSD
	2.33	1.15	2.63	1.25	2.76	1.30	1.47	.234	NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .003$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format used an endpoint Likert scale as follows: 1 = Not Very Confident; 5 = Very Confident.

Table 19

ANOVA Summary for the Relationship of Educator Preparation Program to Teachers' Self-Efficacy for Teaching at Various Inquiry Levels (N=147)

In what manner does the level of an educators' preparation program relate to teacher self-efficacy to teach at various inquiry levels:	Elementary and Secondary						Summary of Significant Differences <sup>1</sup>			
	Elementary (n = 59)		Secondary (n = 62)		Secondary (n = 26)			F	p	η <sup>2</sup>
	M	SD	M	SD	M	SD				
<b>Depth of Knowledge 1 (DOK 1)**</b>										Elem > Sec Elem > Both
Draw, illustrate, label a diagram (4a)	4.24	.78	3.90	.79	3.70	.97	4.78	.010		NSD
Identify, define, recite, quote, recognize, recall or memorize concepts (4b)	4.46	.80	4.11	.91	3.92	1.20	3.72	.027		NSD
Calculate, measure, tabulate, arrange or match items or data (4c)	4.39	.77	3.95	.84	3.88	1.07	5.11	.007		NSD
<b>Depth of Knowledge 2 (DOK 2)</b>										NSD
Infer, predict, observe, interpret, use context clues, estimate, or identify patterns (4d)	3.86	1.03	3.63	1.09	3.33	1.20	2.09	.128		NSD
Categorize, classify, compare, organize, distinguish, or summarize ideas or data (4e)	3.75	.91	3.83	.84	3.44	.87	1.89	.155		NSD
Graph, construct or modify data or results (4f)	3.88	1.02	3.97	.85	3.85	.78	.22	.805		NSD
<b>Depth of Knowledge 3 (DOK 3)</b>										NSD
Assess, investigate, or compare information or data (4g)	3.88	.99	3.94	.87	3.64	1.08	.87	.422		NSD
Develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions (4h)	3.49	1.15	3.58	1.14	2.83	1.31	3.69	.027		NSD
Use concepts to solve non-routine problems or explain phenomena (4i)	3.21	1.00	3.62	.93	3.25	.94	3.05	.005		NSD
	3.54	1.12	3.74	1.00	3.23	1.11	2.08	.128		NSD
	3.17	1.14	3.69	.97	3.38	1.17	3.54	.031		NSD
	2.90	1.03	3.45	1.13	3.16	.94	4.05	.019		NSD

(continued)

(continued)

Table 19 ANOVA Summary for the Relationship of Educator Preparation Program to Teachers' Self-Efficacy for Teaching at Various Inquiry Levels (N=147)  
(continued)

In what manner does the level of an educators' preparation program relate to teacher self-efficacy to teach at various inquiry levels:	Elementary and Secondary								Summary of Significant Differences <sup>1</sup>
	Elementary (n = 59)		Secondary (n = 62)		Secondary (n = 26)		F	p	
	M	SD	M	SD	M	SD			
<b>Depth of Knowledge 4 (DOK 4)</b>	3.10	1.01	3.49	0.97	3.23	1.10	2.37	.097	NSD
Design or create a model to illustrate an idea (4j)	3.26	1.13	3.47	1.02	3.12	1.33	.99	.373	NSD
Connect, synthesize or apply concepts to deepen understandings (4k)	3.10	1.11	3.52	1.04	3.40	1.12	2.35	.099	NSD
Critique, prove or analyze to solve problems or understand abstract concepts (4l)	2.97	1.09	3.52	1.07	3.16	1.11	3.88	.023	NSD

<sup>1</sup>NSD = No Significant Difference

Note: Post-hoc Scheffé mean difference is significant at the  $p = .05$  level.

\*\*Using the Bonferroni adjustment required significance at the dimension level is  $p < .013$  and  $p < .004$  at the item level.

\* Effect size guidelines indicate .01 = small; .06 = medium; .14 = large.

The response format used an endpoint Likert scale as follows: 1 = Not Very Confident; 5 = Very Confident.

## APPENDIX B

### 21<sup>st</sup> Century Skills Assessment

This survey asks questions about the instructional practices used in your classroom and how you feel about a variety of instructional options that are available to educators. The information you provide will be assessed for use in planning professional development opportunities across a variety of settings. Your assistance with this work is much appreciated and valued greatly.

#### SECTION I: Instructional Practice

1. Read each item carefully. Then circle the number that best fits your answer. Circle only one response for each item, using the following scale:

Never      Once a Year      Once a Month      Once a Week      Daily  
 1                      2                      3                      4                      5

How often in the school year, do you require your students to do the following...					
a.	locate their own information on an instructional topic from books? ( <i>Research</i> )	1	2	3	4 5
b.	locate their own information on an instructional topic from electronic resources? ( <i>Research</i> )	1	2	3	4 5
c.	interpret, analyze or evaluate information on an instructional topic? ( <i>Research</i> )	1	2	3	4 5
d.	synthesize information on an instructional topic using multiple resources? ( <i>Research</i> )	1	2	3	4 5
e.	visualize information on an instructional topic? ( <i>Cognition</i> )	1	2	3	4 5
f.	share curiosity and/or use imagination on an instructional topic? ( <i>Cognition</i> )	1	2	3	4 5
g.	find solutions to multistep problems? ( <i>Cognition</i> )	1	2	3	4 5
h.	think critically and apply thinking to find a creative solution to a challenge? ( <i>Cognition</i> )	1	2	3	4 5
i.	present information on an instructional topic? ( <i>Communication</i> )	1	2	3	4 5
j.	collaborate and work in instructional groups? ( <i>Communication</i> )	1	2	3	4 5
k.	engage in evidence-based discussions? ( <i>Communication</i> )	1	2	3	4 5
l.	support claims with evidence through written or verbal communication? ( <i>Communication</i> )	1	2	3	4 5
m.	use skills and knowledge to find solutions to school and community issues? ( <i>Civic Contribution</i> )	1	2	3	4 5
n.	adapt and adjust to unexpected changes to solve non-routine problems? ( <i>Civic Contribution</i> )	1	2	3	4 5
o.	practice entrepreneurship or create a product from a concept they developed? ( <i>Civic Contributor</i> )	1	2	3	4 5

2. How often in the school year, do you require your students to do the following... Please circle your responses below.

a.	draw, illustrate, and/or label a diagram? ( <i>DOK 1</i> )	1	2	3	4 5
b.	identify, define, recite, quote, recognize, recall or memorize concepts? ( <i>DOK 1</i> )	1	2	3	4 5
c.	calculate, measure, tabulate, arrange or match items or data? ( <i>DOK 1</i> )	1	2	3	4 5
d.	infer, predict, observe, interpret, use context clues, estimate, or identify patterns? ( <i>DOK 2</i> )	1	2	3	4 5
e.	categorize, classify, compare, organize, distinguish, or summarize ideas or data? ( <i>DOK 2</i> )	1	2	3	4 5
f.	graph, construct or modify data or results? ( <i>DOK 2</i> )	1	2	3	4 5
g.	assess, investigate, or compare information or data? ( <i>DOK 3</i> )	1	2	3	4 5
h.	develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions? ( <i>DOK 3</i> )	1	2	3	4 5
i.	use concepts to solve non-routine problems or explain phenomena? ( <i>DOK 3</i> )	1	2	3	4 5
j.	design or create a model to illustrate an idea? ( <i>DOK 4</i> )	1	2	3	4 5
k.	connect, synthesize or apply concepts to deepen understandings? ( <i>DOK 4</i> )	1	2	3	4 5
l.	critique, prove or analyze to solve problems or understand abstract concepts? ( <i>DOK 4</i> )	1	2	3	4 5

### **SECTION II: Confidence in Implementing Instructional Practices**

1. This section asks some questions about your comfort level regarding the use of a variety of the instructional practices used in your classroom. Circle the number that best fits your answer.

	Not Very Confident					Very Confident
	1	2	3	4	5	
<b>How confident are you in requiring your students to do the following...</b>						
a. locate their own information on an instructional topic from books? ( <i>Research</i> )						1 2 3 4 5
b. locate their own information on an instructional topic from electronic resources? ( <i>Research</i> )						1 2 3 4 5
c. interpret, analyze or evaluate information on an instructional topic? ( <i>Research</i> )						1 2 3 4 5
d. synthesize information on an instructional topic using multiple resources? ( <i>Research</i> )						1 2 3 4 5
e. visualize information on an instructional topic? ( <i>Cognition</i> )						1 2 3 4 5
f. share curiosity and/or use imagination on an instructional topic? ( <i>Cognition</i> )						1 2 3 4 5
g. find solutions to multistep problems? ( <i>Cognition</i> )						1 2 3 4 5
h. think critically and apply thinking to find a creative solution to a challenge? ( <i>Cognition</i> )						1 2 3 4 5
i. present information on an instructional topic? ( <i>Communication</i> )						1 2 3 4 5
j. collaborate and work in instructional groups? ( <i>Communication</i> )						1 2 3 4 5
k. engage in evidence-based discussions? ( <i>Communication</i> )						1 2 3 4 5
l. support claims with evidence through written or verbal communication? ( <i>Communication</i> )						1 2 3 4 5
m. use skills and knowledge to find solutions to school and community issues? ( <i>Civic Contribution</i> )						1 2 3 4 5
n. adapt and adjust to unexpected changes to solve non-routine problems? ( <i>Civic Contribution</i> )						1 2 3 4 5
o. practice entrepreneurship or create a product from a concept they developed? ( <i>Civic Contribution</i> )						1 2 3 4 5

2. How confident are you in requiring your students to do the following... Please circle your responses below.

a. draw, illustrate, and/or label a diagram? ( <i>DOK 1</i> )						1 2 3 4 5
b. identify, define, recite, quote, recognize, recall or memorize concepts? ( <i>DOK 1</i> )						1 2 3 4 5
c. calculate, measure, tabulate, arrange or match items or data? ( <i>DOK 1</i> )						1 2 3 4 5
d. infer, predict, observe, interpret, use context clues, estimate, or identify patterns? ( <i>DOK 2</i> )						1 2 3 4 5
e. categorize, classify, compare, organize, distinguish, or summarize ideas or data? ( <i>DOK 2</i> )						1 2 3 4 5
f. graph, construct or modify data or results? ( <i>DOK 2</i> )						1 2 3 4 5
g. assess, investigate, or compare information or data? ( <i>DOK 3</i> )						1 2 3 4 5
h. develop logical arguments, formulate hypotheses, cite evidence, or draw conclusions? ( <i>DOK 3</i> )						1 2 3 4 5
i. use concepts to solve non-routine problems or explain phenomena? ( <i>DOK 3</i> )						1 2 3 4 5
j. design or create a model to illustrate an idea? ( <i>DOK 4</i> )						1 2 3 4 5
k. connect, synthesize or apply concepts to deepen understandings? ( <i>DOK 4</i> )						1 2 3 4 5
l. critique, prove or analyze to solve problems or understand abstract concepts? ( <i>DOK 4</i> )						1 2 3 4 5

### **SECTION III: Information About You**

This section focuses on some questions about you. The details you provide will remain confidential and will not be linked to your personal identity in any way.

- List the content areas you teach: \_\_\_\_\_
- My educator preparation program **primarily** targeted:(select only one option)
  - ☐ Early Elementary (pK-2)
  - ☐ Elementary (3-5)
  - ☐ Middle Level (6-8)
  - ☐ Secondary Level (9-12)



3. I completed my educator preparation program in the year: \_\_\_\_\_
4. Please list the school you currently teach in: \_\_\_\_\_
5. I have been teaching in the classroom: ☐ <5yrs ☐ 5-10yrs ☐ 11-20yrs ☐ 21-35yrs ☐ >35yrs
6. Number of years I have been teaching in my current position: \_\_\_\_\_
7. Please indicate how satisfied you are with your current teaching assignment:
- ☐ Very Dissatisfied ☐ Dissatisfied ☐ Neither Satisfied nor Dissatisfied ☐ Satisfied ☐ Very Satisfied

**Thank you for completing this survey, your contributions are greatly valued.**

If you would be willing to participate in a 90-minute focus group that will discuss the topics presented in this survey, kindly select your preference of dates and provide your email address below (check as many as you may be available for to assist scheduling). Dinner will be provided.

- |                                                     |                                                      |
|-----------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Friday, October 18 at 5PM  | <input type="checkbox"/> Monday, October 21 at 5PM   |
| <input type="checkbox"/> Tuesday, October 22 at 5PM | <input type="checkbox"/> Thursday, October 24 at 5PM |
| <input type="checkbox"/> Monday, October 28 at 5PM  | <input type="checkbox"/> Tuesday, October 29 at 5PM  |

I can be contacted at the following: Email: \_\_\_\_\_ Phone: \_\_\_\_\_

Willingness to participate in focus groups will not compromise the confidentiality of responses on this survey.

**Please contact Kimberly Laliberte @ [klaliberte@jwu.edu](mailto:klaliberte@jwu.edu) with any questions regarding this work.**