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EDUCATIONAL PLANNING

A JOURNAL DEDICATED TO PLANNING, CHANGE, REFORM, AND THE IMPROVEMENT OF EDUCATION

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FROM THE EDITORS

This issue of Educational Planning is focused on planning issues of educational evaluation and assessment at K-12 and higher education levels. A variety of planning interests in educational evaluation and assessment are covered. In the first article, a new rubric is introduced to provide institutional strategic planning committees with feedback throughout the strategic planning process to help colleges and universities strengthen their strategies and strategic plans. The second article deals with the challenging task of assessment of ethics in higher education. The third article is a report on sharing valuable personal program evaluation experiences. The fourth and the fifth articles relate to the evaluation of school facility planning leading to more efficient school building for educational purposes.

Smucker and Grant introduced a rubric to provide higher education institutions with the opportunity to assess their strategic plans holistically or analytically. By applying this rubric formatively, institutions may improve their strategic plans by gaining added insights to their strategic planning process, strategic thinking, and strategies.

The paper by Chance and her colleagues synthesizes existing literature (research and policy) related to engineering ethics education (EEE) and provides a useful introduction to planners regarding ethics understood to incorporate global responsibility and sustainability. The authors conclude by providing a foundation for more systematic investigation of EEE at a global level, highlighting implications of this scoping study for teaching, research, and planning.

Ferrara shares her valuable program evaluation experiences by exploring issues that had to be confronted over a three-year period in terms of two New York State funded grants for which she was the evaluator. Major critical challenges in the program evaluation processes are presented, described, and discussed.

In his article about evaluation of educational buildings that facilitate teaching and learning, Earthman, with his fifty years school facility planning and managing experiences, professionally critiques on the effectiveness of instruments that measure school building conditions. He claims that the secret to effectiveness remains with the composition of the instrument. If the instrument contains items that have a research basis and accurately measure the building feature or element that directly influences student/teacher performance, it will produce the data needed for the study.

Finally, Chan developed the School Facility I.Q. Inventory (SFIQI), an instrument to assess the extent of knowledge a school administrator possesses in delivering their duties to manage their school buildings. The instrument can be used for assessment or self-assessment of a school administrator's knowledge about school facilities. It can also be used as a teaching tool in the school leadership preparation programs.

These selected articles have explored the themes of planning for educational evaluation and assessment from introducing special evaluation instruments to the critique of existing instruments. The efficient process of planning for educational evaluation and assessment was also discussed with personal experiences. Educational planners from all levels could learn from the many real cases of educational program evaluation and assessment cited by distinguished authors in this issue.

Editor: Tak Cheung Chan
Associate Editors: Walt Polka and Holly Catalfamo
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September 2022

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A FORMATIVE TOOL AND APPROACH TO ASSESSING STRATEGIC PLANS IN HIGHER EDUCATION

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ABSTRACT

As an alternative to Hunt et al.'s (1997) general guidelines for strategic planning and Chance and William's (2009) summative rubric for evaluating university strategic plans, this article proposes a new rubric, the Rubric for Formatively Assessing Strategic Plans in Higher Education. The purpose of this new rubric is to provide institutional strategic planning committees with feedback throughout the strategic planning process to help colleges and universities strengthen their strategies and strategic plans. This formative approach is especially supportive of colleges and universities who are seeking to or who are in the process of changing their vision or core strategies. Additionally, the rubric is designed to meet the diverse needs of colleges and universities, including large and small schools, private and public, and community college through graduate programs, who create a similarly wide range of strategic planning products (e.g., websites, booklets, briefs) that serve varied audiences (e.g., administrative teams, faculty and staff, students, alumni, the public) by framing strategic plans into four core components: informative inputs, strategic direction, strategic actions, and design. Finally, the rubric provides institutions with the opportunity to assess their plans holistically or analytically, thereby providing an efficient multi-use tool. By applying this rubric formatively, institutions may improve their strategic plans by gaining added insights to their strategic planning process, strategic thinking, and strategies.

OVERVIEW

For over a decade, researchers, policy makers, business leaders, higher education leaders, faculty, staff, and students have called for change in higher education (Baer & Druin, 2020; Chamorro-Premuzic & Frankiewicz, 2019; Taylor & Machado, 2006). These calls reverberated across colleges, universities, and our society during the multiple crises faced over the past year and several months, including the pandemic, structural and systemic racism, mounting student debt, budget shortfalls due to antiquated funding models, and an overall inability of higher education institutions to quickly respond to changing internal and external environments. As Kurshan (2020) stated, "we now see clearly that the campus model of post-secondary education, with its deep structural problems highlighted by the pandemic, is neither sustainable nor scalable" (para. 1). Strategic planning has been viewed as a catalyst or a vehicle for change in organizations. However, the result has often been an entrenchment and maintenance of the status quo, resulting in institutions that continue to be out of touch with societal needs (Kurshan, 2020). As Taylor and Machado (2006) explained,

> Thus, over time, the HEI [Higher Education Institution] gets farther out of equilibrium with the external reality with which it must interact. In time, this disconnect reaches a point where institutional change becomes inevitable and unavoidable. At this point, a crisis management mode of response is generated. In some cases, it is only partially effective and fails to fully align the HEI with its environment. (p. 153)

The recent pandemic and social crises brought to the breaking point the disconnect and disequilibrium reflected in Taylor and Machado's perspective from 2006. Additionally, strategic planning efforts have been criticized for being too linear, relying heavily on hard data, being too structured, ignoring

context and culture, and discouraging creativity (Bryson, 2018). Furthermore, strategic planning and the resulting processes and products fall short because universities do not communicate plans effectively (Fleuriet & Williams, 2015), do not prioritize stakeholders who are not in positions of power (Falqueto et al., 2020), and tend to minimize bold initiatives and disruptive innovation (Hall & Lulich, 2021). Reviewing these criticisms, one may wonder why higher education institutions should engage in the process at all. The answer is simple: if higher education institutions want to fulfill their mission of creating public value, they must change and evolve. In order to change, they must engage in a concerted, systematic, yet flexible effort that allows the institution to evaluate and respond to challenges. In other words, they must engage in effective strategic planning efforts. With this goal in mind, strategic planning is viewed as a continual process, rather than an event completed at a discrete point in time. In response to the iterative nature of strategic planning, we propose a tool that assesses strategic initiatives and informs this continual cycle of reflection and growth.

The purpose of this article is to provide an alternative rubric to the one put forth by Chance and Williams (2009). They published the *Rubric for Assessing Quality of a University's Strategic Plan* in Educational Planning in response to a dearth of resources specifically assessing the products of the strategic planning process. We agree with Chance and Williams that universities need a tool for assessing the quality of their strategic plans. However, our new rubric, the *Rubric for Formatively Assessing Strategic Plans in Higher Education,* differs from Chance and Williams' (2009) on three levels. First, this new rubric takes a formative approach to assessment and provides feedback throughout the strategic planning process instead of a summative approach at the end of the process. Second, the rubric strives to be appropriate for a wider range of colleges and universities by framing strategic plans into four core components that should be evident and aligned within the plan: informative inputs, strategic direction, strategic actions, and design. Third, the rubric provides institutions with the option of assessing their plans holistically or analytically, thereby providing an efficient multi-use tool. Ultimately, this new rubric aims to provide institutional strategic planning committees with feedback throughout the strategic planning process to help colleges and universities strengthen their strategies and strategic plans.

FOUNDATION FOR THE RUBRIC

We drew from both the strategic planning and program evaluation literature for the development of our formative rubric to support the strategic planning, implementation, and monitoring processes. From this literature, we based the development of our rubric on three foundational principles: (a) strategic thinking is the core practice of strategic planning, (b) a theory of change undergirds strategic plans, and (c) logic models support the development of a theory of change.

Our first foundational principle comes from Mintzberg's seminal article in 1994 that challenges the very notion that strategy can be planned. Rather, Mintzberg calls for a focus on strategic thinking in which the strategy-making process is creative and fluid. Strategic thinking moves beyond the managerial role of the planning process and engages in strategy development by cultivating an integrated vision for the organization rather than a sequential plan (Mintzberg, 1994). In this sense, Bryson's (2018) description of strategic planning as the clarification of an organization's mission, vision, and goals, as well as the process of formulating and implementing supporting strategies, means that a strategic plan is more about the strategic thinking that leads to and is embodied by the plan, rather than the plan itself. Applied to institutions of higher education, strategic planning, and therefore strategic thinking, can (a) help unify subgroups within colleges and universities by creating a clear identity and (b) lead institutions in the changes needed for further advancement (Taylor & Machado, 2006).

Our second foundational principle for developing a rubric focused on formative feedback is the concept of *theory of action*. A theory of action is an underlying theory upon which a program is created to meet a specific need (Mertens & Wilson, 2018). Another term used to describe theory of action is *theory of change* (Stufflebeam & Shinkfield, 2014). Strategic plans, in and of themselves, are based on a theory of change in the sense that they are created to bring about change in an organization, including institutions of higher education (Baer & Druin, 2020). In any type of endeavor, whether it be the strategic planning process or the creation of a program to meet a specific need at an institution, leaders typically consider the context within which the strategic plan or program is implemented, the resources needed for implementation, the strategies or processes for the strategic plan or program, and the stated outcomes or goals. These aspects of planning, implementation, and monitoring align with a tool often used in program planning and evaluation – the development of a logic model which is the third foundational principle for the development of our formative rubric.

Logic models typically consist of inputs, processes, and outcomes. A theory of action provides a basis for the logic model, and in this case, a strategic plan, as the plan serves as the underlying theory of how the organization proposes to achieve the intended outcomes. In practice, the connection among theory of action, logic models, and strategic planning can help institutions of higher education conceptualize the strategic planning process. For example, if a logic model was layered over the strategic planning process, one might consider the college or university's mission to be an input, their strategic plan to be an output, and the embodiment of their vision to be an outcome. While a logic model viewed from this perspective may help in the planning process in creating a theory of change for the organization, logic models can also serve as an input as they support the strategic thinking a planning team engages in while considering the specific value the organization provides to their stakeholders (Mertens & Wilson, 2018). In this sense, logic models and the strategic planning process are recursive as one continually informs the other.

Given the relationship between strategic planning in higher education and program evaluation, Shufflebeam's (2003) Context, Input, Process, and Product (CIPP) Model serves as an appropriate framework for analyzing and reorganizing the elements of existing strategic planning models into a common, de facto strategic planning model. While *context* would be specific to each organization applying the strategic planning model, *input*, *process*, and *product* are themes common across popular models of strategic planning that have been used over the past forty years (see Table 1; Allison & Kaye, 2015; Bryson, 2018; Morrison et al., 1984).

While various models propose different steps for navigating strategic planning, we have categorized these steps into three mechanisms: context and inputs, process, and products. *Context* includes the community needs being met by the institution, with the specific community being defined by the institution. *Inputs* are a combination of internal and external factors that influence decisions during the strategic planning process. External factors can include governance, legal, and financial mandates, as well as pressure from collaborative stakeholders, while internal factors can include the institution's mission and values; policies, procedures, and practices; and students, faculty, staff, administrators, and other stakeholders. Taken together, *context* and *input* provide the background and situational factors that must be considered in the strategic planning process. The *process* itself involves (a) reviewing and updating the institution's vision, (b) identifying and prioritizing strategic risks and issues, (c) identifying core strategies, and (d) designing an implementation plan, including goals and means of communicating the strategic plan to stakeholders. Finally, the *products* are generally implied through the monitoring and evaluation steps of strategic planning and include formalized written plans, whether comprehensive or focused, and communications with stakeholders.

Table 1

Reorganization of Existing Strategic Planning Models into Context & Inputs, Process, and Products

Strategic planning models	Context & Inputs	Process	Products
Morrison et al. (1984)	Environmental scanning	Evaluating the issues Forecasting Goal setting Implementation	Monitoring
Allison & Kaye (2015)	Step 1: Set up for Success Step 2: Internal Stakeholder Engagement Step 3: Mission, Vision, Values	Step 4: Environmental Scan Step 5: Theory of Change and Program Portfolio Step 6: Business Model Step 7: Organization Capacity Step 8: Leadership	Step 9: Complete the Strategic Plan Step 10: Use Your Plan Successfully
Bryson (2018)	Step 1 Initial Agreement Step 2 Mandates Step 3 Mission and Values Steps 4a & 4b External & Internal Environments	Step 5 Strategic Issues Step 6 Strategy Formulation Step 7 Strategy & Plan Review and Adoption Step 8 Description of Organization in the Future Step 9 Implementation	Step 10: Strategy and Plan Processes Reassessment

STRATEGIC PLANS: THE PRODUCT OF THE STRATEGIC PLANNING PROCESS

As the purpose of this article is to propose a new tool for assessing strategic plans, we will focus on the products produced throughout the strategic planning process. One product, or genre of products, may be a formal written plan. For some institutions, this is a comprehensive plan published through a website or booklet, while other institutions may prefer more targeted or concise summary documents. Further, some institutions may prefer to create one document or source that is publicly available to all stakeholders while others create custom documents for various stakeholder groups (e.g., students, faculty and staff, alumni). While the format of these plans may differ, the general purpose is to articulate how an institution will get from where they are to where they want to be (Bryson, 2018). Eckel and Trower (2019) further challenge colleges and universities to develop plans that are meaningful, in that they influence and change the trajectory of the institution. Of equal importance, Allison and Kaye (2015) remind us that plans are not just sets of steps or goals but a

form of communication, so the success of a plan is contingent on how well the design of the plan communicates the intended steps and goals clearly and convincingly to an institution's stakeholders (Fleuriet & Williams, 2015). Therefore, a plan must entail enough detail to provide readers with context, direction, and needed next steps in a way that is approachable, convincing, and actionable.

To meet these expectations, strategic planning experts propose various elements to include in strategic plans. In reviewing these elements, three overarching categories, or components, emerged: informative inputs, strategic direction, and strategic actions (see Table 2; Allison & Kaye, 2015; Bryson & Alston, 2011; Loria, 2020). *Informative inputs* are similar to the context and inputs examined in strategic planning, like the mission and values of the institution, performance data, and stakeholder input, and they provide context for those reading, analyzing, and applying the plan. A plan's *strategic direction* is composed of elements that indicate the big-picture and overarching goals of the institution, such as the vision statement and core strategies. Together, the informative inputs and strategic direction should allow readers to imply the institution's strategic issues if they are not explicitly stated within the plan. Finally, *strategic actions* are the details a plan provides for achieving the core strategies and implementing the plan, such as goals and objectives, implementation steps, and monitoring and revision schedules.

Table 2

Reorganization of Existing Strategic Plan Models into Three New Components

Models of strategic plans	Informative inputs	Strategic direction	Strategic actions
Allison & Kaye (2015)	Introduction by the board president and/or executive director Executive summary Mission and values statements History of organization (optional) External environmental themes	Vision statement Summary of core strategies	Program portfolio and plans Business model and financial plans Organizational capacity development plans Leadership development plans
Bryson & Alston (2011)	Executive summary Introduction (purpose, process, & stakeholder participation) Mission statement Mandates Environmental analysis	Vision statement Strategic issues Grand strategy statement Issue-specific strategy statements Subunit strategy statements	Goals, objectives, and outcomes Implementation and action plans Other related plans Monitoring and evaluation plans Plans for updating the plan
Loria (2020)	Current state Risks and assumptions	Top initiatives	Future state (SMART goals)

Need for Fourth Component: Design

As stated earlier, the purpose of a strategic plan is to communicate how an institution will get from where they are to where they want to be (Allison & Kaye, 2015; Bryson, 2018). While the components just discussed illustrate the current state of an institution, its goals, and its intended strategies for reaching those goals, they fail to directly address how the strategic plan will be communicated to various stakeholders. Therefore, we propose a new fourth component: the design of a strategic plan. We consider strategic plans to be products of the strategic planning process that serve as communication platforms. Therefore, we define the design of a strategic plan not as the design process within strategic planning but as the physical manifestation of the strategic plan itself. To address the recommendations of Eckel and Trower (2019), we propose that the design of a strategic plan should provide clear communication that compels stakeholders to support and enact the plan. To accomplish this, we suggest that strategic planners consider the following questions:

1. What are the stakeholder groups that must support the plan in order for it to succeed (e.g., faculty, staff, students, alumni, community partners, media)?
2. How can and should the strategic plan be communicated with various stakeholders?
3. How are various stakeholders explicitly or implicitly addressed within the manifestations of the strategic plan?
4. How should the final product be customized to address the needs of different intended audiences?

By considering and meeting the needs of various stakeholders, we propose that a strategic plan's design should make the plan usable and accessible for the intended audiences.

ASSESSING STRATEGIC PLANS

While evaluating models for both strategic planning and strategic plans, we found consistent references to elements of reassessment, evaluation, and monitoring (e.g., Allison & Kaye, 2015; Bryson, 2018; Bryson & Alston, 2011; Morrison et al., 1984), and strategic planning models emphasize feedback loops and a non-linear approach to strategic planning (Allison & Kaye, 2015; Bryson, 2018; Hinton, 2012; Hunt et al., 1997; Morrison et al., 1984). Based on these models, strategic plans are primarily assessed to determine the effectiveness of their strategies, but we support two additional purposes assessment can serve. First, plans should be assessed to determine if they cohesively and coherently direct an institution from point A to point B. In other words, does the plan answer Holcomb's (2008) five questions for navigating change: (1) "Where are we now?" (2) "Where are we going?" (3) "How will we get there?" (4) "How will we know we are there?" and (5) "How can we keep it going?" (p. 2). Second, plans should be assessed to determine if they appeal to stakeholders as the plan will not be successful if stakeholders are not willing to support it and make changes. Therefore, the design and content of an institution's plan must (a) gain the support of key policy actors who can strategically tell the story of the plan, advocate for it, and share it with others (Ball et al., 2011) and (b) build capacity amongst stakeholders by providing skills, clarity, and motivation (Fullan, 2016).

Despite the recommendation to continually engage in feedback and cyclical planning, there are limited specifications on how to monitor and assess strategic plans. Hunt et al. (1997) provided guidelines that may help institutions engage in self-evaluation, such as (a) coupling assessment to the strategies, (b) using efficient tools, (c) providing timely feedback, (d) and responding to changing conditions with flexibility. For a more structured approach to assessing strategic plans, Chance and Williams (2009) developed the *Rubric for Assessing Quality of a University's Strategic Plan* as a means of assessing whether a college or university's strategic plan serves its purpose over

time. As such, institutions can use this tool as a summative evaluation and holistically determine to what degree elements of their strategic plans meet the criteria provided by Allison and Kaye (2015). While some institutions have created their own rubrics for in-house use (e.g., San Antonio College, 2021; the American University in Cairo, n.d.; UNC Greensboro, 2021), there is a need for an additional structured tool that is peer reviewed and meets Hunt et al.'s (1997) and Hinton's (2012) criteria by effectively providing timely feedback throughout the change cycle that is strategic planning.

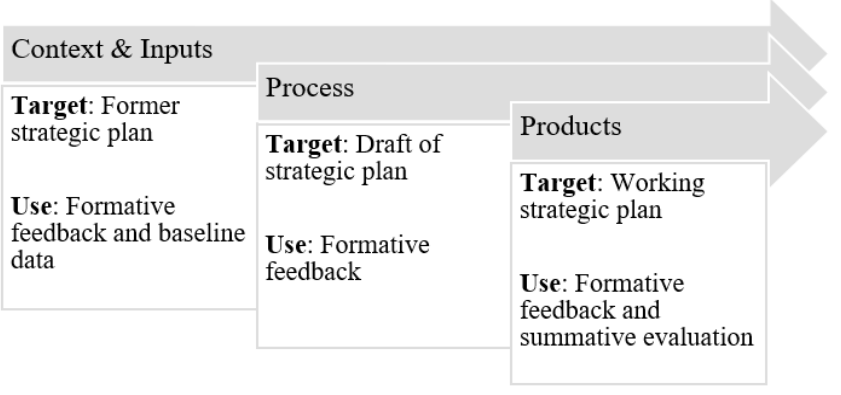
A NEW RUBRIC FOR FORMATIVELY ASSESSING STRATEGIC PLANS

As an alternative approach to Hunt et al.'s (1997) general guidelines and Chance and William's (2009) summative rubric, we propose a new rubric, the *Rubric for Formatively Assessing Strategic Plans in Higher Education,* designed to serve as a formative assessment. The purpose of formative assessment is to make informed changes throughout the process, to include the monitoring, implementing, and adjustment making aspects of the strategic planning process. Summative assessment, on the other hand, is an assessment of a point in time to make a judgement without the next step of making changes based on what is learned. In essence, a summative assessment of the strategic plan would best be described as a planning autopsy. In support of a formative assessment process, we define a strategic plan, not as a document published at the end of the strategic planning process, but as formal representation of how the organization will prioritize and navigate changes that is created and evolves throughout the planning process.

Strategic planning experts note the importance of continual review and revision of strategies and the strategic plan through a non-linear, iterative planning process (Allison & Kaye, 2015; Bryson, 2018; Hinton, 2012; Hunt et al., 1997; Morrison et al., 1984). Complementing Mintzberg's (1994) focus on strategic thinking, Frechtling (2007) describes the need for *evaluative thinking* to drive changes based on continual review and assessment. Bryson's model (2018) calls for a specific step focused on assessing and revising strategies and strategic plans. Further, Hinton (2012) advises that strategic planning should be a "self-sustaining process" and to "keep the plan flexible and allow the institution to adjust to changes in the environment" (p. 20). Accordingly, we advocate for formative assessment as it aligns with the need for flexibility and creativity in responding to changing contexts. As such, our rubric can be applied to and provide feedback for all three mechanisms of strategic planning (i.e., context and inputs, process, and products) and strengthen the planning process through that feedback. Figure 1 outlines the strategic planning products that are being targeted and analyzed during each strategic planning process, as well as how the evaluation of each product can be used as formative feedback for continued strategic thinking. First, our rubric can be used to evaluate the previous strategic plan, and the results can serve as feedback for implementing the strategic planning process and as baseline data alongside other input data. Second, the rubric can be used to evaluate drafts of the strategic plan throughout the planning process, and the results can serve as feedback to further develop and align the plan's components. Third, the rubric can be used to evaluate the complete working draft of the strategic plan, and the data can be used as continued formative feedback for refinement or as a summative evaluation of the planning process and products.

Figure 1

Employing Rubrics to the Context & Inputs, Process, and Products of Strategic Planning



A rubric that can be applied in such a formative fashion is especially supportive of colleges and universities that are changing their vision or core strategies. Following Kotter's (2014, 2018) *8-Step Process for Leading Change*, leaders can (a) demonstrate the need for change using an assessment of the previous strategic plan, (b) strengthen the alignment between their core strategies and vision by assessing drafts of their strategic plan, and (c) remove barriers to goal achievement by continuing to assess and refine their working strategic plans.

Vertical Columns: Rubric Levels of Quality

The *Rubric for Formatively Assessing Strategic Plans in Higher Education* honors a formative approach by using a developmental scale for scoring criteria. A developmental scale aligns with the formative uses of the rubric as it allows users to see how an element may be improved based on the developmental scale continuum. Scores range from *one* (developing) to *three* (exemplary), without the use of *zero* or *not applicable* as the components and elements of strategic plans have been consolidated and are all considered necessary within this rubric for sufficiently communicating a cohesive and coherent plan that is conducive to driving change within the institution.

Horizontal Rows: Rubric Criteria/Components of Strategic Plans

This new rubric is unique in that it provides colleges and universities the option to evaluate their strategic plan holistically or by analyzing multiple traits. If an institution desires a general description of their strategic plan's cohesiveness, coherence, and ability to conduct change, then a holistic overview can be assessed. If an institute opts for an analytic assessment, this rubric is flexible and also individually measures four traits, referred to here as components of a strategic plan, and eight criteria, referred to as elements. The components and elements (outlined below) have been consolidated from Allison and Kaye's (2015) and Bryson and Alston's (2011) models in order to be applicable to a wide range of higher education institutions, including large and small schools, private and public, and community college through graduate programs. Descriptors within this rubric are intentionally written in general terms and can be applied to a similarly wide range of strategic planning products (e.g., websites, booklets, briefs) and audiences (e.g., administrative teams, faculty and staff, students, alumni, the public). The flexibility between holistic and analytic analysis and the consolidated components and elements strengthens this formative tool as these features make the rubric applicable to more strategic plans than the Chance and Williams (2009) rubric and provide institutions with choices for how and when to apply the rubric to their individual planning process and products.

Component 1: Informative Inputs

An institution's strategic plan should provide readers with contextual information and convey the current mission and values of the institution. The right balance of background information should be provided in order to clearly understand the rationale for the plan. This may include a purpose statement, summary of the strategic planning process, stakeholder participation and input, relative mandates, an overview of the institution's history, current risks, and assumptions, and/or other details as appropriate. Through a formal mission statement or similar construct, the institution's purpose, guiding values, and theory of action should be clearly identifiable and inspiring to stakeholders.

Component 2: Strategic Direction

Additionally, a strategic plan should articulate the institution's vision and core strategies. Through a formal vision statement or similar construct, the institution's vision for success should be clearly identifiable, inspiring to stakeholders, and coherent with both the mission and core strategies. Core strategies should be presented in a way that clearly represents the institution's top initiatives, addresses the institution's strategic issues and vision, and implies what the institution will continue doing, initiate, and discontinue.

Component 3: Strategic Actions

To reinforce the strategic direction, the strategic plan should also include information about specific goals and supports. Goals/objectives should align with the core strategies and be written to be specific, measurable, attainable, relevant, and time-bound. Through the goals/objectives, a separate narrative, appendix, supplemental document(s), or other such construct, an action plan should clearly indicate how the strategic plan will be implemented and monitored, as well as how coupling between subgroups of the institution will provide resources and supports for achieving the core strategies.

Component 4: Design

Finally, and most importantly, this rubric assesses a plan's design to determine if it is usable and accessible for the intended audience. This component specifically requires assessors to consider each of the other components and elements as they are presented to and might be interpreted by various stakeholder groups. The plan's components and elements should be aligned in a way that is operational, and it should be organized so that each subgroup of the institute knows their role. The plan's elements should be communicated in a way that is easy to understand, creates buy-in, and is organized in a user-friendly, appealing style.

RUBRIC FIELD TESTING

To test the validity and utility of our proposed rubric, we used it to evaluate the strategic plans of two institutions of higher education. Our goals for this field test were twofold. First, we wanted to determine if the rubric could be used to accurately assess strategic plans while helping us, as a mock strategic planning team, evaluate the strengths and weaknesses of those plans. Second, we sought to use the rubric with two institutions with substantial differences in order to evaluate the utility of this rubric across diverse contexts. To these ends, the publicly available strategic plans of two institutions were analyzed by each author. We then compared scores and discussed how we came to our decisions across each component of the rubric.

The first institution was a public junior college located in a rural setting and serving approximately 2,500 students. Their strategic plan served a five-year period of time and was communicated through a digital booklet easily accessible through their website. Overall, their plan had strengths in all areas of the rubric, particularly in terms of their strategic direction, and there were opportunities for refinement within all other areas. In terms of informative inputs, their plan included a purpose statement, stakeholder participation and input, and a clear mission statement and values. However, a summary of their strategic planning process and more information about the unique needs of their institution would have clarified and supported the rationale for the plan. Their plan also included clear strategic direction through an inspiring vision statement and explicit core strategies that were measurable and time-bound. Their strategic actions included goals that aligned with these core strategies, but it was not clear who would be monitoring the implementation of the plan nor how success would be evaluated. Finally, the overall design of the plan was very effective. The plan was aligned across all of the components, was easy to understand, included numerous photos that inspired buy-in, and was organized in a logical way. However, the plan could have been improved if the roles and responsibilities for implementation were more explicit for subgroups of the institution. Altogether, the plan had many strengths, and our rubric provided feedback that their strategic planning committee could have used to improve the elements of context, support, and usability.

Our second institution was a public four-year college that is located in an urban setting and serves approximately 20,000 students. Their strategic plan spanned a six-year period of time and was communicated through a digital report available on the university's website. Like the first institution, this plan had strengths in all areas, but it had particular strengths in strategic direction and strategic actions with opportunities for improvements in informative inputs and design. In terms of informative inputs, the plan provided rich background information and context, including a description of their connections with the surrounding community. While the plan did include a formal mission statement and values, the mission could be rewritten to be more inspiring to stakeholders. As with the first institution, the plan included a clear strategic direction through an inspiring vision statement and explicit core strategies. The strategic actions included goals that aligned with these core strategies, and the plan included a transparent, clear action plan, including links and references to multiple supporting documents that stakeholders could use during implementation. Finally, the design of the plan, particularly its usability, was supported through tables that clearly connected subgroups of the institution to elements of the plan. However, this plan was text-heavy, and its accessibility could be improved through the use of photos and graphics. There was also little representation of institution culture, and photos and other representations of their school spirit and culture could improve stakeholder buy-in for the plan and make the overall design more appealing. As with the first institution, our rubric served to provide feedback, specifically about the plan's mission statement and accessibility, that could help a strategic planning committee make targeted improvements.

As we field tested our rubric, we made four overarching observations. First, the process of evaluating a strategic plan was strengthened by taking a team approach. Accordingly, we recommend that strategic plans be analyzed by multiple reviewers as we found that quality improvements can be identified and made through both consensus and disagreement. Second, we noted that each institution, as well as our rubric, used variations of the language for strategies and goals. Despite these differences, it was clear that some initiatives represented overarching core strategies while others represented more focused goals and objectives. Therefore, we recommend that reviewers carefully consider the criteria descriptions within our rubric rather than focusing on particular use

of vocabulary. Third, we want to emphasize the importance of design. Each plan that we reviewed included clearly communicated elements, but there was a marked difference in the overall style of each plan that greatly impacted the plan's appeal to and buy-in from stakeholders. Consequently, we highly recommend that strategic planning teams carefully consider how the overall design of their plans appeals to, can be used by, and will inspire change in their stakeholders. Lastly, we found the detailed formative feedback provided by the rubric and the process of the applying the rubric to be clear, targeted, and beneficial. Therefore, we recommend that institutions try our rubric as a means of engaging in meaningful discussion about their strategic plans throughout the planning process.

CONCLUSIONS AND RECOMMENDATIONS

There are three main benefits to using the *Rubric for Formatively Assessing Strategic Plans in Higher Education*. First, this rubric can be applied to and provide formative feedback to help strengthen all three mechanisms of strategic planning: the context and inputs, process, and products. Second, this rubric strives to serve the needs of colleges and universities with various types of strategic planning products by framing strategic plans into four core components: informative inputs, strategic direction, strategic actions, and design. Third, this multi-use rubric provides institutions with the choice of analyzing their strategic plans holistically or analytically.

Additionally, we offer two considerations for institutions when selecting an assessment tool for evaluating their strategic plans. First, by striving to reach a broader audience, the rubric may not be specific or comprehensive enough for some institutions, especially for those institutions accustomed to more extensive plans and criteria. In these cases, Chance and Williams' (2009) rubric may be a better fit for the institution. Second, each criterion within the rubric is given equal weight, but some strategic planners may prefer to emphasize some criteria over others.

The *Rubric for Formatively Assessing Strategic Plans in Higher Education* provides colleges and universities with an additional tool for evaluating their strategic plans. By applying this rubric formatively, institutions may improve their strategic plans by gaining added insights to their strategic planning process, strategic thinking, and strategies.

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Rubric for Formatively Assessing Strategic Plans in Higher Education

Component	Element	Exemplary (3 points)	Proficient (2 points)	Developing (1 point)
Informative Inputs	Context This may include a purpose statement, summary of the strategic planning process, stakeholder participation and input, relative mandates, an overview of the institution's history, current risks and assumptions, and/or other details as appropriate.	The right balance of background information is provided in order to clearly understand the rationale for the plan.	Background information is provided, but there is not enough to fully understand the rationale for the plan.	The rationale for the plan is not discernible from the background information provided.
	Mission & Values This may include a formal mission statement, values statements, and/or similar constructs.	The institution's purpose, guiding values, and theory of action are clearly identifiable *and* inspiring to stakeholders.	The institution's purpose, guiding values, and theory of action are implied but not clearly identifiable, *or* the mission is only marginally inspiring to stakeholders.	The institution's purpose, guiding values, and theory of action are not discernable, *or* the mission is not inspiring to stakeholders.
		6 5	4 3	2
Strategic Direction	Vision This may include a formal vision statement or similar construct	The institution's vision for success is clearly identifiable, inspiring to stakeholders, *and* coherent with both the mission and core strategies.	The institution's vision for success is implied but not clearly identifiable, the vision is only marginally inspiring to stakeholders, *or* there is misalignment between the vision, mission, and core strategies.	The institution's vision for success is not discernable, the vision is not inspiring to stakeholders, *or* there is no alignment between the vision, mission, and core strategies.
	Core Strategies	Core strategies are presented in a way that clearly represent the institution's top initiatives, address the institution's strategic issues and vision, *and* imply what the institution will continue doing, initiate, and discontinue.	Core strategies are implied but not explicit, mildly address the institution's strategic issues and vision, *or* imply what the institution will continue doing, initiate, or discontinue, but not all three.	Core strategies are not discernable, do not address the institution's strategic issues or vision, *or* fail to indicate what the institution will continue doing, initiate, or discontinue.
		6 5	4 3	2
Strategic Actions	Goals	Goals/objectives align with the core strategies *and* are written to be specific, measurable, attainable, relevant, and time-bound.	Goals/objectives are misaligned to the core strategies *or* are partially written to be specific, measurable, attainable, relevant, and time-bound.	Goals/objectives do not align with the core strategies *or* are not specific, measurable, attainable, relevant, and time-bound.

Component	Element	Exemplary (3 points)	Proficient (2 points)	Developing (1 point)
Strategic Actions (cont.)	Support This may include the goals/ objectives, a separate narrative, appendix, supplemental document(s), or other such construct	An action plan clearly indicates how the strategic plan will be implemented and monitored *and* how coupling between subgroups of the institution will provide resources and supports for achieving the core strategies.	An action plan implies how the strategic plan will be implemented and monitored, *or* how coupling between subgroups of the institution will provide resources and supports for achieving the core strategies.	An action plan for how the strategic plan will be implemented and monitored is not discernable, *or* how subgroups of the institution will provide resources and supports for achieving the core strategies is unclear.
		6 5	4 3	2
Design	Usable	The plan's components and elements are aligned in a way that is operational, *and* it is organized so that each subgroup of the institution knows their role.	The plan's components and elements are misaligned and impact smooth operations, *or* it is organized so that each subgroup of the institution must imply their role.	The plan's components and elements do not align, *or* it is organized so that subgroups of the institution are unclear of their roles.
	Accessible	The plan's elements are communicated in a way that is easy to understand, creates buy-in, *and* is organized in a user-friendly, appealing style.	The plan's elements are communicated in a way that is mostly understandable, creates some buy-in, *or* is fairly organized and appealing.	The plan's elements are communicated in a way that is difficult to understand, fails to create buy-in, *or* is disorganized and unappealing.
		6 5	4 33	2
Holistic Evaluation		The strategic plan is cohesive, coherent, and conducive to driving change within the institution.	The strategic plan is generally cohesive and coherent, but there may be areas where this is not the case and restricts the institution's ability to conduct change.	The strategic plan has elements working toward creating change within the institution, but potential change is hindered by a lack of cohesiveness and coherence.
		24 23 22 21 20	19 18 17 16 15 14 13	12 11 10 9 8

Rubric Results

Analytic Assessment		
Identify whether each component was a strength or opportunity.		
Strength	Component	Opportunity
□	Informative Inputs	□
□	Strategic Decisions	□
□	Strategic Actions	□
□	Design	□

Holistic Assessment
Identify the overall level of quality for this plan.
□ Exemplary
□ Proficient
□ Developing

THE ASSESSMENT OF ETHICS: LESSONS FOR PLANNERS FROM ENGINEERING EDUCATION'S GLOBAL STRATEGY

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ABSTRACT

This translational scoping study investigates how ethics learning is assessed in engineering education worldwide and interprets concepts and practices for relevance to educational planners at the postsecondary level. It provides insights on how engineering education has achieved a level of standardization globally, a calibration process that has facilitated infusion of prioritized abilities across engineering graduates broadly. The engineering education system is designed and maintained through a series of multi-jurisdictional accords that seek to prepare engineering graduates for a global marketplace of engineered products, goods, and services. This paper synthesizes existing literature (research and policy) related to engineering ethics education (EEE), providing a useful introduction to planners regarding ethics, understood to incorporate global responsibility and sustainability. Conclusions provide a foundation for a further systematic investigation of EEE at a global level, highlighting implications of this scoping study for teaching, research, and planning.

INTRODUCTION

To address global challenges, educators and planners need to work together to infuse ethics across all realms of educational planning (Chance, 2012). Ethics must underpin all educational offering from individual course/modules to program curricula, with consideration for formal as well as informal learning environments. Ethics also needs to become a core principle in planning, fundraising, operations, and maintenance (Chance & Cole, 2015). We understand ethics in a broad manner, to include aspects of professional and global responsibility, as well as social and environmental sustainability (Martin, 2020).

This article examines the assessment and evaluation of ethics in engineering education, focusing on how to transfer learning from engineering ethics education and research into educational planning beyond the field of engineering. Our aim is to help educational planners identify concepts and practices supporting the integration of ethics across a diverse range of academic activities and institutional practices, including curriculum design and assessment.

Engineering education has taken a multi-pronged approach that involves research, the scholarship of teaching and learning (i.e., applying research-informed pedagogies), and accreditation standards shared via multinational accords. As part of these efforts, the engineering ethics education community has been working together to promote and support the integration of ethics into engineering curricula. Most often, this has been achieved through the adoption of specific modules with targeted content, but the community is also advocating for more holistic approaches.

They debate the value of micro-inserts across the curriculum and institution wide and of dedicated ethics modules (Martin, Conlon, & Bowe, 2021a). Because this community is succeeding at sowing the seeds of ethics education in specific modules and now, increasingly, weaving these more broadly across programs, we believe their example will be of interest to experts involved in institutional or policy planning.

The study scopes the education literature on assessment and evaluation of ethics in engineering, to address one overarching research question: What aspects of engineering ethics education can be of use to educational planners?

We supplement this with three sub-questions:

1. In what ways are engineering students' abilities in ethics measured and assessed?
2. What new research could help us better assess the ethical abilities of students?
3. What existing tools and techniques can be used by planners to assess the ethical dimensions of their practice?

Our analytical review starts by explaining the nature of engineering as an increasingly globalized profession, to understand the particularities of engineering and how learning might be transferred to other fields. We then describe the role of accreditation systems and global accords in aligning the engineering profession across the world and we point to recent changes and suggestions for improving the formulation of accreditation criteria targeting ethics. Next, we address institutional aspects pertaining to quality assessment and physical planning, highlighting challenges and opportunities. We then discuss how educators assess ethics in education and the difficulty of measuring ethical development, providing examples of standardized tests and rubrics. We conclude with a list of recommendations for educational planners and developing research into the planning, assessment, and quality assurance of ethics education.

BACKGROUND INTO THE GLOBAL CONTEXT OF ENGINEERING

A broad and institution-wide implementation of ethics is crucial for educating students to practice responsibly and respond to global challenges (Truslove, Crichton, Chance, & Cresswell-Maynard, 2021). Engineering education is supported by research into the teaching and assessment of ethics and sustainability. Within this field, there has been focus on sharing ideas, terms, techniques, practices, and standards trans-nationally. Much of this work is conducted in English, as it is the language of global engineering practice, of the multi-national accords, and of a large community of engineering education researchers (Seargeant, Hewings, & Pihlaja, 2018).

Engineering students are seen as emerging professionals who will practice in a globalized industry (Lucena et al., 2008). Engineering graduates will ultimately design products, systems, and artefacts for a global audience. They receive education that will allow them to work in places all around the world. Even as students, they will be expected to work within highly diverse teams, with an international and cross-cultural composition (Giovannelli & Sandekian, 2017). This differentiates engineering from more localized professions, like law and architecture, where knowledge is tied to local contexts and practice is regulated at the state or national level (Andresen, Pattie, & Hippler, 2020).

Increasing mobility across workplaces exerts pressure on educational and professional bodies to expand agreed codes and expectations of professional competencies beyond national boundaries. A key indicator that expectations have been changing can be seen in the "efforts by engineering education organizations to extend themselves beyond countries" (Lucena et al., 2008, p.433). As a global profession, it has been necessary for engineering to develop means for aligning

educational systems worldwide in ways that can ensure essential knowledge, skills, and values are developed uniformly (Lucena et al., 2008). Engineering education has developed a system for sharing teaching and evaluation techniques and standards at a more global level than most professions. Engineering education is complemented by research into learning and teaching, which has achieved notable success in getting ethics on the agenda of engineering educators worldwide (Martin, Conlon, & Bowe, 2021a). The standardized approaches underlying the sharing of ethics teaching and assessment tools and practices trans-nationally may be useful to educational planners and others working outside engineering.

METHODOLOGY

The literature scoped in this review has been interpreted and translated for relevance and use by educational planners. This translational research constitutes 'scholarship of integration' since we seek to bring discipline-specific knowledge and concepts, developed within the field of engineering education, to an audience of educational planners extending beyond engineering. Our novel contribution is to translate into educational planning implicit and explicit concepts used in engineering education.

We conducted a non-systematic literature review, guided by the methodological recommendations developed by Borrego, Foster, and Froyd (2014). For this, we first set research questions for the study and criteria for selecting relevant studies. Afterwards, we searched for relevant publications. The search was conducted in SCOPUS using the following search string: TITLE-ABS-KEY (accredit* OR evaluat* OR assess* OR quality) AND engineering AND ethics AND education). We included articles published in education and engineering education journals, book chapters, the proceedings of major engineering education conferences—such as those organized by the American Society of Engineering Education (ASEE) and the European Society for Engineering Education (SEFI) or the Frontiers in Education conference (FiE)—and policy documents issued by accrediting bodies. The rationale for including all three publication types was to identify key research and to highlight emerging trends and activities in engineering ethics education. The search was conducted in English, and solely sources published in English were considered.

The listing of research publications was screened for relevance for the research questions stated above. We also screened the collection of sources retrieved relative to a prior review on engineering ethics education conducted by one of the authors (Martin, 2020). We considered which of the sources held relevance to educational planners outside engineering. The process resulted in (1) eliminating sources generated through the search query that were overly specific or specialized and (2) adding sources located by Martin (2020) that held additional relevance.

We then analyzed the publications focusing on three levels of analysis which have been previously used in engineering education research by Lattuca and Stark (2009) and Martin, Conlon, and Bowe (2021a). As such, the review analyzed sources relevant for ethics assessment and evaluation at three levels: (1) the policy level, (2) the institutional level, and (3) the level of individuals.

RESULTS

In what follows, we present the results of the review focusing on each of the three levels on-by-one: policy, institutional, and individual.

Policy Level

The policy level is represented by academic accreditation. Here, we consider accreditation requirements, professional codes, and other complementary policies focused on ethics.

Engineers are taught specific knowledge, skills, and values as a part of their preparation to join the workforce. Accreditation standards attempt to ensure students master an appropriate range and depth of knowledge, skills, and values, irrespective of the location of their degree. Below, we investigate the role of accreditation systems and accords in promoting coverage of ethics in engineering curricula. Connecting individual higher education institutions and their engineering programs to the cross-jurisdictional accords and helping guide them in implementing actions that meet the spirit of the accords are various regional organizations. These include the European Network for Accreditation of Engineering Education (ENAEE) and the International Engineering Alliance (IEA), which jointly published a report on best practices in the accreditation of engineering programs (ENAEE & IEA, 2015).

Accreditation systems and accords

Three important multi-lateral accords have helped ensure some level of alignment across professional engineering degree programs, globally. These are the Washington Accord, Sydney Accord, and Dublin Accord. These formal agreements among professional agencies in various jurisdictions regulate engineering accreditation within each agency's geo-political boundaries.

The outcome of the globalization process (Sthapak, 2012) and of the domination exercised by the US in the engineering education landscape (Anwar & Richards, 2013), is that the Washington Accord has expanded and currently includes 20 countries with full rights as well as eight provisional signatories. As Klassen (2018) noted, since its inception over 30 years ago, the Washington Accord has grown in both scope and power.

The United States Accreditation Board for Engineering and Technology (ABET) is part of these accords, as are institutions in other English-speaking jurisdictions (including Engineers Canada, the Engineering Council in the UK, Engineers Australia, Engineers Ireland, the Engineering Council of South Africa) and many non-English jurisdictions.

The International Engineering Alliance (2022), a global non-profit organization, explains that through "Educational Accords and Competence Agreements members of the International Engineering Alliance establish and enforce internationally bench-marked standards for engineering education and expected competence for engineering practice" (p.2). Members of this Alliance come from 29 countries and represent 41 jurisdictions. Members use seven existing international agreements to govern professional competencies and educational qualifications.

The accords provide mutual recognition and help ensure that the various jurisdictions that enlist will align their accreditation standards and criteria for graduates so that all exit university with an adequate level of preparation in essential areas (International Engineering Alliance, 2022). The adoption of global accords has led to the alignment of accreditation systems in signatory countries, and as such, to the formulation of accreditation requirements that, although not completely overlapping (Patil & Gray, 2009), nevertheless have a similar focus (Hanrahan, 2008). For the Washington Accord, ethical responsibilities and the societal role of the engineering profession are important, as graduates are expected to "apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice" (International Engineering Alliance, 2014, p.15).

The emphasis of global accords on ethical and societal considerations in engineering has led to the establishment of engineering ethics education as a mandatory accreditation requirement in signatory countries (Coates, 2000). Having an accreditation criterion dedicated to ethics contributed to the development and enhanced presence of ethics in the engineering curriculum (Lattuca, Terenzini, & Volkwein, 2006). The specifications of global accords now inform engineering curricula worldwide, and as a result, the accreditation standards and taught content in most areas of the world have become increasingly clear and aligned (Philips, Peterson, & Aberle, 2000).

More recently, several accrediting bodies undertook processes of reformulating their criteria for accreditation. Most of the changes reported target ethics. As such, Engineers Ireland introduced a new program outcome called Engineering Management and a new program area of Sustainability (Engineers Ireland, 2022). The latter requires covering data science, analytics, and the ethical use of data and technology; equality, diversity and inclusion related to professional practice; and teamwork and communication. Engineers Ireland's program outcome for ethics is now much more specific. Sustainability is now mentioned 15 times and diversity five times (Byrne, 2022), compared with five mentions for sustainability in the previous Accreditation Criteria (Engineers Ireland, 2014). In the UK, the most notable change in accreditation standards has been in "refining how global responsibility is presented and evolving the way it is taught" (Truslove et al., 2021, p.1). Changes implemented though the fourth edition of the UK's Accreditation of Higher Education Programmes (Engineering Council, 2020) also "recognize the responsibility and skills needed of engineers to create positive change to society and global challenges" (Truslove et al., p.1).

A new competence framework on sustainability has been recently developed by the European Commission. GreenComp comprises 12 desired competencies grouped into four themes: embodying sustainability values (valuing sustainability, supporting fairness, and promoting nature); embracing complexity in sustainability (systems thinking, critical thinking, and problem framing); envisioning sustainable futures (futures literacy, adaptability, exploratory thinking), and acting for sustainability (political agency, collective action, and individual initiative) (Bianchi, Pisiotis, & Cabrera, 2022, p.2). These competencies are correlated and specifically defined. For instance, political agency means "to navigate the political system, identify political responsibility and accountability for unsustainable behavior, and demand effective policies for sustainability" (p.15), whereas collective action requires one "to act for change in collaboration with others" (p.15). This type of specificity is needed as we move ahead toward creating more effective systems for collective action to address ethical breaches and shortfalls, across governments and engineering professional bodies (Chance et al., 2021).

Gwynne-Evans, Chetty, and Junaid (2021) advocate that engineering policymakers should integrate ethics across a wide range of graduate attributes, rather than limit ethics and sustainability to just a few criteria. They argue that, given that accreditation has been a primary motivator for change in engineering education, engineering accrediting bodies need to provide more specific definitions of what "ethics" entails. According to them, few accreditation systems require any level of student output or performance related to ethics, instead overemphasizing outcomes purporting to "awareness" or "understanding" to the neglect of demonstrating ethical behavior. Gwynne-Evans, Chetty and Junaid (2021, p. 11) assert that ethical behavior is "the *object of study* rather than its *objective*", in stark contrast to other accreditation elements. As such, they propose a model for integrating ethics across all graduate attributes in South Africa, a country which follows the Washington Accord. The model combines narrative descriptions with graphical depictions, to aid in reconceptualizing *how* and *where* ethics can fit into what is often called a "tightly packed"

engineering curriculum. Incorporating this framework nationally, and requiring an integrated approach for accreditation, would foster quick adoption in South Africa. The proposal could be relevant in other national settings as well.

Professional bodies

Professional bodies not only regulate the activities, duties, and expectations of the profession, but also play an important role in shaping engineering education. Lucena et al. (2008) compared shifting competencies standards across engineering education systems in the US, Europe, and Latin America, finding that US-based organizations were "attempting to expand directly from the country to the globe, relying upon prior acceptance of a redefinition of required competencies" (p.433). Europe and other parts of the world took longer to standardize because organizations first had to come to common agreement, regarding definitions of competencies, across diverse linguistic and cultural groups (p.440).

Membership in professional bodies requires long-term commitment to a set of values and behaviors that display specific standards of ethics and expertise. Professional codes of conduct can complement the formal third-level curriculum and help us identify "what counts" (Downey & Lucena, 2005, p.252) within the engineering profession, and how this has changed over time.

Professional codes are a key support for education, professional practice, and informing the public about the ethical principles important for a profession (Laas, Davis, & Hildt, 2022). They play a significant role for the professionalization of an occupational group because they represent "the external hallmarks testifying to the claim that the group recognizes an obligation to society that transcends mere economic interest" (Luegenbiehl & Puka, 1983, p.41). As such, codes typically highlight a profession's expected behaviors that may include one's conduct with guidelines for performing services, issuing statements, or avoiding specific acts (AlZahir & Kombo, 2014) as well as the desirable virtues and character traits of professionals, such as honesty, integrity, impartiality, or prudence (Frezza & Greenly, 2021). Cheville and Heywood (2015) found nine main areas of focus, pertaining to (1) the obligation for the greater good or public welfare, (2) the relation to those outside the profession, (3) professional roles and conflicts of interest, (4) relations with those whom the profession serves, (5) professional reputation, relationships, and responsibilities, (6) professional competence, (7) confidentiality, (8) continuing education, and (9) commitment for advocacy.

Educational planning efforts may benefit by inserting curriculum elements that introduce students to the role, content, and societal value of ethics, individual and collective responsibility, and professional codes. These can offer a common understanding of what a commitment to ethics implies (Li & Fu, 2012, p.340) and ways in which codes can be continuously improved to address societal needs and incorporate broader values, such as care and inclusivity (Warford, 2018).

Institutional Level

This section is focused on how the implementation of ethics is evaluated for quality within the larger institution. As this article is geared toward education planners, we also include reflections on how ethics can factor into physical planning.

Quality assurance and enhancement

In the United States, ABET accredits individual engineering programs, rather than conferring professional accreditation on an overall college or institution (ABET, 2021). This type of system holds true across most English-speaking countries and regions (Stensaker, 2011). This

means that each separate degree program engineering college or faculty offers must periodically update or reaffirm its professional accreditation.

According to Kam (2011), the accreditation process for engineering programs typically involves three stages that nearly all accreditation bodies related to engineering, technology, or computing currently use: (1) the program's self-assessment, which is guided by the appropriate accrediting body's standards and expectations, (2) peer-assessment, which involves document review and a (typically face-to-face) campus visit where appointed experts review and assess evidence provided by the program, and (3) a review by the accrediting organization regarding the overall set of evidence and recommendations accumulated, leading to an official decision. These elements equate accreditation with quality assurance and enhancement (Kumar, Shukla, & Passey, 2020).

Historically, ethics has been the program outcome with the lowest scores for meeting the accreditation requirements (Martin, 2020). Additionally, measuring ethical development at the institutional and individual levels is difficult. Educators face dilemmas when preparing for engineering accreditation, in not knowing exactly when, where, and how they cover ethics in their modules and courses (Martin, 2020). Linked to this, a historical challenge faced by program administrators is to determine what "ethics" means in the context of the program they are delivering and to develop evaluation metrics assessing its attainment (Martin, 2020), as well as determining what type and amount of evidence should be collected (Ferguson & Foley, 2017).

The self-assessment stage of the accreditation process is especially prone to mistakes in ensuring the consistency among self-assessment scores, the supporting evidence provided, and the realities of classroom teaching (Martin, 2020). As Deegan (2021) found, organizing and archiving evidence online may carry distinct advantage for planners. The benefits range from increased accessibility and efficiency, to ensuring consistency and creating opportunities for review and dialogue among academic teams. For Deegan (2021), the online process was more accessible for the assembly and participation of external stakeholders such as industry representatives and alumni panelists. Due to its success, this online review approach has been adopted as the model for evidence preparation and presentation by Engineers Ireland for subsequent accreditation activities. It may be useful for educational planners in others context struggling to organize the evidence related to ethics for accreditation or inspection by external bodies.

Furthermore, feedback received by programs from accrediting bodies in the past has sometimes been either lacking or not constructive to the evaluated programs (Barry & Ohland, 2012, p.389; Murphy, O'Donnell, & Jameson, 2019). This may impede the accreditation process from fostering improvement of a program's educational offerings. Looking at how these policies are enacted in specific sub-disciplines, Byrne (2022) pointed to wording from the Institution of Chemical Engineers (2021), which is directing accreditation assessors to evaluate the appropriateness of a given university's policies in the areas of health and safety, sustainability, ethics, diversity and inclusion; the attitude and level of adherence of the university's staff to these policies; and the extent to which students are engaged in the policies (p.51). All these challenges point to the need for developing robust quality metrics and success criteria for the provision of ethics education, to maximize the quality assurance and enhancement role of accreditation processes.

Physical planning

Ethics should be at the core of an educational planner's work at every stage—from conceptualization and brief-writing for all new projects, programs, curricula, and facilities, to the

detailed design, implementation, operationalization, and monitoring and assessment of each of these. Empson, Chance, and Patel (2019) question if any design can be considered creative if it fails in responding to Sustainable Development Goals (SDGs). Considering the topic of evaluation and assessment, one wonders how performance in these realms ought to be measured and assessed (Antes et al., 2009).

Regarding physical planning and the development of buildings and infrastructure to run our campuses, planners can reference the United Nations' SDGs. Planners can strategize using recommendations from the Leadership in Energy and Environmental Design (LEED) Green Building Rating program, the Building Research Establishment's Environmental Assessment Method (BREEAM), and the International WELL Building Institute. Using established and emerging software tools, planners can predict future performance on measurable outcomes (such as water and energy use), select efficient options, construct, and install sustainable structures, and measure eventual performance outcomes. These programs and tools can facilitate water use reduction, land erosion reduction, habitat and culture preservation, reductions in embodied energy and carbon footprint, material recycling, construction waste reduction, improved daylighting, reduction of toxins in our interior spaces, and enhanced energy performance.

Raworth's (2017) "doughnut model", environmental footprint calculators, the LEED, BREEAM, and WELL programs all focus on environmental sustainability. The green building programs also promote wellbeing of people at a local level. For instance, promoting design that is healthier and more pleasant for occupants. Designs that provide good daylight, for instance, can facilitate higher levels of learning as verified by increased test scores (Barrett, Davies, Zhang, & Barrett, 2015). Buildings can be designed to impart lessons about the environment and how to value it (Chance, 2010; Chance & Cole, 2015; Orr, 1999). Planners and designers can use green rating systems to improve community connectivity and decrease the reliance on cars and long-distance shipping.

Although these green rating programs offer subtle forms of support for social justice, their focus is environmental. Regarding benchmarking, tracking, and assessing improvement in the realm of planning, the SDGs provide the best recognized tools. Each SDG focuses attention on items where humans need to improve their performance, to become more fair, equitable and sustainable about social, environmental, and economic longevity and justice.

Planners have viable criteria for making our buildings and grounds, and even operations and maintenance just and sustainable and for assessing performance over the long-term (although few campuses do this well). We lack, however, sufficient tools for assessing ethical decision making in other realms of planning. We also currently lack physical infrastructure for operating higher education institutions sustainably (and thus ethically), and we lack adequate delivery of ethics education to the students at our campuses, as discussed below.

Individual Level

This section discusses approaches to measuring and assessing ethical development, presenting popular standardized student assessments and the factors considered. It then shifts to the need to continuously assess ethics throughout an engineer's career following graduation, via Continuing Professional Development programs and support measures.

Assessment approaches

Although educators aim to teach students about social and environmental sustainability and how to make responsible and ethical decisions, we still have a weak understanding of how to define, measure, and assess students' abilities and learning gains. Being abstract, ethics is a difficult subject to cover during the university years at any level higher than "awareness" or "understanding" (Gwynne-Evans, Chetty, & Junaid, 2021). Ethical behavior and character development are particularly challenging (Clancy & Gammon, 2021).

There are multiple approaches and variations in the assessment of ethics in engineering education. Some of these refer to the use of assessment procedures (Bielefeldt, Canney, Swan, & Knight, 2016; Goldin, Pinkus, & Ashley, 2015). Others focus on the learning outcomes that are being evaluated (Martin, Conlon, & Bowe, 2021a), sometimes considering whether ethics should be assessed numerically or via standardized instruments (Keefer, Wilson, Dankowicz, & Loui, 2014), and at which point during a course to conduct the assessment (Gwynne-Evans, 2021). These approaches to assessment may be influenced by how ethics learning outcomes are conceptualized and articulated, as focused on knowledge and skills or attitude and values (Gwynne-Evans, 2021, p.178). At the same time, it is acknowledged that the ethical components of technical courses often remain unassessed (Keefer et al., 2014).

Instructors' unfamiliarity with evaluating and grading ethics (Davis & Feinerman, 2012), coupled with the limited guidance on what assessment methods can be used for nontechnical subjects (Keefer et al., 2014) contributed to variation in approaches. Moreover, the personal influence of instructors' teaching approaches and their views on ethics (Goldin, Pinkus, & Ashley, 2015) are relevant factors in the delivery and assessment of a student's level of understanding and/or ability regarding ethics.

These challenges have led to the development of standardized assessment instruments, scoring rubrics and instruments. Standardized tests have played a central role in the assessment of individual students' understanding and ability regarding ethics (Table 1).

Nevertheless, there are difficulties in tracing causal connections between some of the experiences included in the surveys and an individual's actions, as to attribute them a formative role in the development of students' ethical behavior. Similarly, ethical awareness cannot be said to necessarily lead to ethical behavior (Haidt, 2001). As it stands, there is no consensus on the best way to assess the instruction of engineering ethics and the development of the moral awareness or ethical behaviors of students.

Table 1. Standardized assessment instruments for ethics education

Test	Ethical competences or aspects measured
DIT–Defining Issues Test (1979) DIT2 (Rest et al., 1999).	The maturity of reflection on ethical issues when asked to evaluate several ethical dilemmas
SEED-Student Engineering Ethical Development (Finelli et al., 2012; Harding et al., 2015),	The influence of formal and informal ethical experiences on social behavior
EPRA-Engineering Professional Responsibility Assessment (Canney & Bielefeldt, 2016).	Views on social responsibility
TESSE-Test for Ethical Sensitivity in Science and Engineering (Borenstein et al., 2008)	Ethical sensitivity and the ability to identify and recognize relevant ethical issues emerging from a situation
ESIT-Engineering and Science Issues Test (Borenstein et al., 2010).	Ethical reasoning and contemplation of technical dilemmas
University of Pittsburgh and Colorado School of Mines test (Sindelar et al., 2003)	The ability to address ethical dilemmas, focused on five attributes of attainment: recognition of an ethical dilemma, argumentation, analysis, perspective taking, and resolution
Colorado School of Mines rubric (Moskal, Knecht, & Pavelich, 2001)	Identification of needs in design projects brought by industry stakeholders
EERI-Engineering Ethical Reasoning Instrument (Zhu et al., 2014)	Individual ethical decision-making in a project-based design context
EDM ethical decision-making instrument (Mumford et al, 2006, Bagdasarov et al., 2016).	Ethical decision-making in real-world scenarios

Continuing Professional Development (CPD)

As new ethics knowledge, technologies, policies, and frameworks for action emerge after engineering students graduate, CPD represents an important way to support the ethical development of the profession and to update the skills and display of ethical values (Chance et al., 2021). Despite its significance, there is still little known about the effectiveness of CPD ethics training (Steele et al., 2016).

Developing a holistic ability in ethics is necessary for the ethical practice of engineering in complex contexts that involve shifting and competing forces. It requires more time than a standard degree course can provide (Chance et al., 2021; Committee on Education, 2019). CPD is an integral component for enhancing the knowledge and abilities of existing practitioners and for scaffolding the development of newly graduated engineers as they are entering engineering practice. The ASCE stated that graduate engineers must be able to: recognize ethical behavior as important; identify and explain ethical responsibilities related to civil engineering; and comply with ethical codes (Committee on Education, 2019). These are seen as basic abilities.

Engineers must, therefore, extend their abilities in this realm post-graduation. ASCE has specified that this should happen via mentored experience early in each engineer's career, so that

the individual has support in handling increasing levels of responsibility and complexity in ethical decision-making (Committee on Education, 2019). Dealing with complex ethics issues embedded in professional practice can help an early career engineer internalize abstract concepts—but if the individual engineer is not supported in addressing dilemmas, s/he can be swept away by existing currents, social, and business pressures. Without good scaffolding and support, the individual may not be able to convert ideal ethical concepts into discrete behaviors. Structured learning and guided mentorship can help engineers as they are confronted with slippery contextual issues and ethical dilemmas that do not have easy or straightforward answers.

Ultimately, each engineer will need to apply appropriate reasoning to analyze the ethical dimensions of complex situations, assess options, and determine ethical courses of action. Engineering operates at such a scale that any individual is a tiny cog in an enormous system, and developing ways to support individuals in sounding alarms, blowing whistles, and helping engineering (as a profession) and society (at large) address harmful tendencies and patterns will be central to achieving continued life on this planet. The Committee on Education (2019) has identified several very-high level abilities that engineers need to develop later in their careers—normally after their structured mentorship ends. These high-level abilities include advocating for ethics in engineering practice and assessing courses of action to resolve ethical dilemmas in complex situations.

CONCLUSIONS

To conclude, we return to the research questions. Addressing, above, two sub-questions, we have seen that engineering students' abilities in ethics are measured and assessed via individual modules, sometimes using standardized instruments, and that accreditation and global accords are major drivers toward having ethics included in the engineering curricula and formally assessed. Furthermore, we have discussed existing tools and techniques, including the SDGs and various green rating programs, which can be used by planners to assess ethical dimensions of their practice. Following on, we now identify several possible paths for research that could help us better assess the ethical abilities of students, under implications for teaching and research. Lastly, we return to the overarching question: What aspects of engineering ethics education can be of use to educational planners? We address this below, under implications for planning.

Implications for Teaching and Research

Engineering ethics education and research are reaching a point of maturity that facilitates the rigorous collection and analytical review of prior studies. In the growing field of engineering education research, meta-analyses and systematic literature reviews provide viable methods for generating new knowledge from previous work (Hess & Fore, 2018; Martin, Conlon, & Bowe, 2021a). In this section, we draw from the scoping review above to identify knowledge gaps and make recommendations.

As a result of this scoping review, we see the need for two separate studies on assessment of engineering ethics education and encourage the research community to consider taking these on board. First, an imperative has emerged to map the varied approaches to assessment and offer insights on the role and empirical benefits of each approach as reported in the literature. Gaining an understanding of the landscape of assessing ethics education can contribute to curricular alignment (Borrego & Cutler, 2010), given that alignment is "still a weakness" (Keefer et al., 2014, p. 259; Li & Fu, 2012; Martin, Conlon, & Bowe, 2021a, 2021b). This scoping study has highlighted the need for additional research on this topic. We therefore propose, as a next step, to conduct a systematic

literature review providing a **meta-synthesis** of studies on the topic of assessment, engineering and/or technology, education, ethics, and responsibility "in order to locate key themes, concepts, or theories that provide novel or more powerful explanations for the phenomenon under review" (Siddaway, Wood, & Hedges, 2019, p.756). This review would rigorously investigate:

1. The assessment methods used in undergraduate engineering ethics education and their distribution.
2. The learning goals (competences, skills, attributes/traits, emotions, behaviors, or attitudes) evaluated.
3. The theoretical perspectives informing the use of assessment methods.
4. The empirical benefits, challenges, lessons learned, and/or recommendations reported in connection with the assessment methods used.
5. How assessment is described to align with the teaching methods or the institutional strategy and vision.

Second, we notice what appears to be a piecemeal implementation of ethics, with a low curricular weight given to learning outcomes related to ethics (Barry & Ohland, 2012; Martin, 2020) and a lesser focus on the societal responsibilities of engineers (Bielefeldt et al., 2016). The justification that engineering programs usually provide for incorporating ethics centers on accreditation requirements (Martin, Conlon, & Bowe, 2021a). This is an extrinsic source of motivation that can lead to less robust responses translating into half-hearted approaches that have low-level buy-in across the engineering faculty. In many cases, ethics has been described as a "box ticking" exercise (Flynn & Barry, 2010, p.2; Martin, 2020). Truslove et al. (2021) assert that addressing sustainability, global responsibility, and SDGs requires more complexity in students' learning process than engineering curricula currently provide.

Furthermore, engineering programs report the lack of "consistent, accurate, and reliable methods of teaching ethics and measuring its outcome" (Bairaktarova & Woodcock, 2015), pointing to issues related to quality assurance. Three key impediments in the quality assurance and enhancement of engineering ethics education pertain to the unconstructive feedback following accreditation events, the lack of guidance on how to operationalize ethics related outcomes in the engineering curriculum, as well as the limited evidence as to what constitutes quality criteria for engineering ethics education (Bombaerts, Doulougeri, & Nieveen, 2019; Murphy, O'Donnell, & Jameson, 2019).

We recommend developing a rigorous study that responds to the need for deeper reflection on quality mechanisms and criteria for engineering ethics education, as well as on the role of various internal and external stakeholders in processes related to quality assurance and enhancement of the implementation of ethics at institutional or program levels. The purpose of the study would be to provide a critical overview of the state of the art in engineering education research on quality assurance and enhancement criteria, mechanisms, and procedures overseeing the implementation and institutional evaluation of ethics in undergraduate engineering education.

The study would enable the engineering education and assessment communities to identify how quality is discussed in relation to the provision of engineering ethics education in the existing literature and regarding criteria, as well as the challenges and deficits encountered, with quality assurance and enhancement processes. An outcome could be to use the findings reported in the literature to propose a quality framework for engineering ethics education. It could include quality standards and a specification of the responsibilities of key internal and external stakeholders in the

quality assurance and enhancement process. We propose that this study could also take the form of a systematic literature review aiming to identify:

1. The current criteria, standards, procedures, and mechanisms reported regarding quality assurance and enhancement of ethics education.
2. The main internal and external stakeholders involved in quality assurance and enhancement in ethics education, and the roles they play.
3. The challenges, deficits, and recommendations reported in connection with setting and enforcing quality criteria for ethics education.

Implications for Planning

Educational planners need to account for the effects of construction and resource consumption on campus, and the values imparted to students. Responsible practices should be visible in all facilities and activities – from classrooms, laboratories, and dining halls to sports facilities, planned events, faculty and student travel, and extracurricular clubs and societies.

Summarizing implications of the above content for use by educational planners, some important lessons are that (1) achieving sustainability is one aspect of ethics and (2) not all professionals at work today will have encountered formal education on this topic (Chance, Direito, & Mitchell, 2021; Chance et al., 2021). Licensure and CPD provide means and incentive to learn about ethics, but new approaches, such as structured mentorship, may be necessary to help support individuals navigate complex situations and confront ethical dilemmas.

Engineering, as a globalized community of practice, has set up systems for ensuring some level of alignment across legal jurisdictions worldwide. Alignment is achieved through the development and uptake of various accords which inform individual accreditation systems around the world. There is a great deal of interaction among engineering accreditation systems, with ABET exercising a strong influence globally. Effects are evident in a move toward greater specificity in definitions and competency requirements currently emerging in individual countries.

Findings of this scoping study hold relevance for practice at: (1) the level of accreditation frameworks and policies, (2) the institutional level pertaining to quality assurance and physical planning, and (3) the level of individual students and engineers. First, we described a model for integrating global priorities based on the current success of engineering accreditation systems to improve definitions to achieve increasingly holistic coverage. Second, we highlighted various approaches to conveying ethical values to students (including discrete modules and more integrated curriculum approaches) that planners might apply in their own organizations. Third, we presented standardized models for assessing various ethics competencies that can be used by instructors beyond engineering where ethics needs greater operationalization. We complemented this with measures for scaffolding students' ethical development post-graduation, through CPD and structured mentorship.

The global community of professional and education bodies in engineering is increasingly aligned. Accreditation, assessment, and accords have been important parts of this shift, as has input from the engineering ethics education research community. This community uses research-informed methods to advocate for change and translate policy into practice, seeing the development of engineering ethics education as a distinct realm of study. Educational planners might transfer learning from the engineering education community of practitioners and researchers as they seek to integrate and evaluate ethics across their own organizations.

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CHALLENGES FACED BY EDUCATIONAL EVALUATORS: PERSONAL EXPERIENCES ENCOUNTERED AND PLANNING ISSUES ILLUMINATED

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ABSTRACT

This article explores issues that had to be confronted over a three-year period in terms of two New York State funded grants for which I was the evaluator. Major, critical challenges are presented, described, and discussed.

Specifically, the paper addresses issues related to lack of planning at the grant design stage that resulted in challenges and problems with conducting targeted and meaningful assessments to complete evaluations. This article promotes the concept that evaluators have expertise and competencies that are valuable to grant design and that if an evaluator is involved at the planning/design stage, many challenges confronted throughout evaluation processes might be prevented or mitigated.

The inquiries that were conducted as part of these grants can be regarded as case studies. In the example of one investigation, it was a single-case study of an intervention in a Long Island, New York, district; in the case of the other, it was a multiple-case study wherein a Charter School disseminated an intervention to three New York City schools. Mixed methods were used for data collection.

Following my work with these two funded grants, with lessons learned from my experiences with these two grants, I embarked on another journey with another agency where lessons learned from the two previous grants informed my approach to evaluating school programs. Thus, while I was not part of the original design team, we were able to discuss relevant evaluation issues early in the process. My latest experiences will also be briefly discussed at the end of the article in a Postscript.

INTRODUCTION AND BACKGROUND

Although there are countless topics of interest to educational planners, in general, there has been limited research regarding competencies of evaluators, especially related to evaluators' contributions to grant development.

While there is little evidence that this line of inquiry has been sufficiently tackled, Volkov (2011) addressed the line of inquiry by arguing that there is a field of expertise that defines the multiplicity of roles for evaluation experts. Sever (2021), building on Volkov's work, conducted a Delphi study to identify themes related to competencies of program evaluation experts, which included theoretical professional competencies, practical professional competencies, professional values experts should have, and professional skills experts should have. Sever's research was conducted under the assumption that program evaluation is a field of expertise.

Sever's study is foundational to the arguments and observations made in this article – that evaluation is a discrete area of expertise with distinct competencies. This issue of competencies had been previously introduced by Nevo (1983), but in general, unfortunately, this topic still appears

not to have gained much traction among practitioners. Additionally, there is a lack of literature regarding the role of the evaluator in the design of funded grants.

There has been useful information from which we can extrapolate evaluator competencies and roles in related areas, such as planning models (Beach, 2022; Ferrara, 2007), evaluation standards (Yarbrough et al., 2011), evaluation approaches (Rossi et al., 2019), program evaluation methods (Posavac & Carey, 1989), and improvement from a human resource frame (Bolman & Deal, 1997). However, this type of information seldom reaches the level of practitioners, especially those who work in schools or in public agencies that deliver educational programs.

In 2016, I began work with two new grant recipients. One evaluation involved an after-school violence prevention program on Long Island, New York, to be implemented in four elementary schools in a district; the other was for the dissemination of an existing school intervention model to a middle school and two high schools in New York City to improve academic outcomes and absentee and truancy rates, as well as to address social needs.

Similarities existed between the programs in terms of goals, although the structures of the programs and activities differed. Both grants dealt with improving outcomes for students, including succeeding in school, enhancing life opportunities, and overcoming environmental factors that lead to participation in violence. In the case of the after-school program, the grant was implemented in four elementary schools in one district for third, fourth, and fifth graders. In the case of the second program, an intervention design previously implemented at a Charter School in New York City was to be disseminated to three public schools in New York City, one middle school and two high schools.

I was contacted after funding had been approved with evaluation designs already incorporated in the grants and was therefore faced with implementing the designs in the approved applications.

In the end, the approach taken for both evaluations was to utilize a case study design (Yin, 1989), to use qualitative data (Bogdan & Biklen, 1989) as well as quantitative data, and to utilize mixed methods and multiple variables (Posavac & Carey, 1989). These choices will become manifest in terms of some of the challenges faced, as explained in this article.

THE LONG ISLAND ELEMENTARY GRANT PROGRAM

The needs this grant addressed were economic disparity, juvenile/student behavior, and academic achievement. At the time of the grant application, the district ranked #3 in extraordinary need compared with other school districts in the county. The community ranked high on juvenile offenses, persons-in-need of supervision (PINS), and youths placed on probation. Active gangs within the community included MS-13.

The student body was diverse – 71% Hispanic and 21% Black. Behavioral suspensions were more numerous at the middle school level than at the high school level. This grant, among other things, addressed risk factors elementary school students faced when they entered the middle school environment.

Grant writers developed goals to address identified student needs - academic support, violence prevention, and youth development. The program framework was to implement for 218 at-risk elementary students a 20-week after-school program running three days a week for two hours daily for a total of 120 hours of instruction and support, with a student-teacher ratio of 10 to 1.

The program contained after-school homework support, humanities and math instruction, and delivery of curricula by a Community-Based Organization (CBO) and a county-wide law enforcement agency (LEA). The CBO curriculum was a character-development program for third, fourth, and fifth grades, and the LEA curriculum was a life skills program for fourth and fifth graders to help them avoid using delinquent behavior and violence to solve problems. Both curricula addressed bullying, violent behaviors, and gang resistance.

THE NEW YORK CITY CHARTER SCHOOL DISSEMINATION GRANT PROGRAM

The applicant for this grant was a charter high school in the West Village serving New York City's most vulnerable youth. Fifty percent (50%) of the school's lottery was set aside for homeless or transitionally housed students, students who had been involved in the child welfare system, or had previously attended middle schools where more than half of the students performed below grade level. Demographic data indicated that 51.7% of students were Black, 40.4% were Hispanic, 74.2% lived at the poverty level, with 79.9% having a designated Economic Need Index.

To address academic and social issues, including trauma, homelessness, and incarceration, the Charter School had implemented an evidence-based intervention model that had resulted in improvements in its school culture, attendance, engagement, and achievement.

Grant goals were not articulated in broad statements but in terms of the components of the intervention model previously implemented at the Charter School. From the grant narrative, I was able to extrapolate measurable goals related to disseminating the intervention model; these included impacting school culture; improving attendance, behavior, decision-making, engagement, and achievement; and training staff in positive behavioral and teacher coaching methods. Charter School personnel were to provide training to the three partner schools.

WHAT CAN HAPPEN WHEN DISCUSSIONS WITH THE EVALUATOR DO NOT OCCUR DURING THE APPLICATION PROCESS

In my experience, grant writers are not trained planners or evaluators. They have limited knowledge of planning models, may not have skills to address "problem anticipation" (Beach, 2020, p. 27), are not aware of factors critical to program evaluation, and throw everything into the "evaluation" mix using a "more is better" approach to secure funding.

What can happen is that grant writers may not neatly align goals, objectives, activities, outcomes, and performance indicators in ways useful to the evaluator. Additionally, they may not anticipate measurement issues, specify data sources, and/or determine whether data will be accessible at all or in a timely manner. Evaluators can be invaluable at the construction phase of a grant in assisting grant writers with all these issues.

Other considerations exist as well. Is the grant being implemented internal to a district or school or external to the funded party/agency: what are the implications of this, what impact may this have on the evaluation process? In the case of the Long Island grant, the grant was implemented internally in the district with a tight oversight structure: the Central Office Administrator oversaw the Program Supervisor who implemented the program who then had oversight over the lead teachers in each of the four elementary schools who then had oversight over the five teachers in each elementary school involved in the program. From an evaluation point of view, this structure was a benefit. On the other hand, there were some issues with data acquisition - assessment tools were mentioned in the grant for which no provisions for development had been discussed or planned.

In the case of the New York City Grant, activities were implemented at three schools external to the applicant school. Unanticipated occurrences brought the activities to a "grinding halt" at the end of the second year of the three-year grant. This was not purely an evaluation issue – but this issue greatly impacted the ability to evaluate this program, especially for the summative three-year comprehensive evaluation. At the point of implementation, two of the three principals from the schools involved in the grant had been transferred to other schools. It took most of the first year to establish a relationship with the two new principals and to get cooperation regarding participation in grant activities. None of the three principals agreed to implement the full model as written into the grant. Resistance continued during the second year of the grant at two of the three schools. In the middle of the second year of the three-year grant, the principal of the applicant school who had written the grant was replaced. At the end of the second year, the full-time Project Coordinator, and the part-time Social Worker both left for other jobs.

By the fall of the third (final) year of the grant, the new principal at the applicant school was not able to re-establish contact via calls or emails with the three schools involved in the grant to re-engage. The principal got the consent of the New York State Education Department (NYSED) to cease activities. Nevertheless, the point-person at NYSED felt that the summative evaluation due after the end of the third year should proceed. If the evaluator had participated in the development of the grant, some challenges this grant posed might have been mitigated, resulting in discussions of "what if" scenarios, most importantly the lack of control the grantee might have had over the entire process.

ADVANTAGES OF THE EVALUATOR'S INVOLVEMENT IN AN EVALUATION DESIGN

There are distinct advantages of evaluator involvement at the development stage of a grant application. The evaluator can assist with the following so that assessment activities go smoothly:

1) ensuring alignment of goals, objectives, and program activities with outcomes, performance indicators, and assessment activities.
2) reviewing prior to implementation of grant activities whether assessment activities are overly ambitious, redundant, and/or need modification/refinement.
3) determining at the planning level who would be collecting and organizing data for the evaluator, in what form, when, and the means by which the evaluator would receive data;
4) ensuring prior to the implementation of grant activities where sources of data to be used in the evaluation are "housed," and whether data will be accessible given the grant cycle.
5) having the opportunity to have discussions about appropriate assessment techniques, particularly in relation to determining whether tools indicated in the grant will achieve their purposes in measuring specified outcomes, and whether assessment tools are valid and reliable; and
6) determining to what extent measurement tools will have to be developed, whether the grantee has the capacity and expertise to do this, and whether the evaluator has the expertise to do this if the grantee does not.

One issue that arose with one of these two grants was that assessment activities were not always aligned with the goals, objectives, and program activities in ways that would guide data collection to specifically address performance indicators. If an evaluator is involved during grant development, the evaluator can assess if there is alignment between and among goals, objectives, activities, outcomes, performance indicators, evaluation strategies, and the tools proposed to accomplish valid and reliable assessments.

With the Long Island program, there was an attempt to consider assessment activities for the goals in the grant, with performance indicators generally more tightly tied to objectives. Still, there were no indications of who would collect data and by what means data would be accessed/and or developed and delivered to the evaluator. It appeared that the implementers of the program were not totally cognizant of the plethora of indices and data the grant specified would be collected. In order to assist the grantee with alignment issues, I generated a list of data the grant indicated or suggested would be delivered, developing a checklist to indicate what I required, from whom, in what time frames, with various other comments and indications of what would be needed to assess stated outcomes.

With the New York City grant, there was also an attempt to consider assessment activities for each of the goals in the grant. However, there was a "laundry list" approach in the specification of the assessment activities. To demonstrate what needed to be done to tighten up this approach, I created a table to exhibit what it would take to align goals, objectives, program activities, outcomes, and performance indicators with assessment activities. For each objective, the laundry list was reformulated into a checklist so that the implementers could check a box to determine for each objective exactly which data would be collected. This approach was necessary so that planning for time points for data collection could be specified, and implementers could determine whether the types of assessments they intended to use would result in the collection of data targeted to their measurable objectives.

A second issue is related to overly ambitious, redundant, and/or incomplete approaches in specifying assessment activities. This was true for both grants. One example of non-aligned redundancy that resulted in modification involved the Long Island grant and related to the proposed collection of three measures, report card data, State assessment data, and digital data to measure academic outcomes. While some redundancy can be useful in conducting research, offering opportunities for triangulation, nevertheless, in this instance, report card data offered the most valid data for the purposes of this research. The stable factor was that regular classroom teachers were assessing their students involved in the program so that analyses could be conducted in a controlled pretest/posttest design. Also, the purpose of the program was not to measure academic outcomes in terms of normative data. The best assessment of student academic improvement was to examine gains across the school year wherein report cards provided three data points, with one data point at about the point of the implementation of the program, one data point at about the time of the conclusion of the 20-week program, and one data point at the end of the school year (Marzano, 2003). The involvement of the evaluator at the grant development phase could have assisted grant writers in streamlining their outcomes assessment processes and choosing the most appropriate measures for analyzing student outcomes, including academic outcomes.

A third issue that arose with both grants was that the person responsible for collecting and organizing data for the evaluator was not specified, the means by which the evaluator was to receive the data were not indicated, the form in which the data were to be received was not documented, nor was the time frame for receipt of data by the evaluator specified. This third advantage relates to the evaluator's being able to troubleshoot and encourage grant writers to document in the grant how data will be received, from whom, when, and in what form.

A fourth advantage of evaluator participation at the grant development level is that those involved in the grant can assure the evaluator that data will be available given the grant and evaluation cycles and will conform with the specifications of the grant. I have encountered issues with both of the grants described above relative to data not being available in a timely manner. In the case of the Long Island grant, student report cards were used to assess academic outcomes; report cards are normally not available until the second or third week of July. The Central Office Administrator had requested that the evaluation be completed

around the end of June or beginning of July. Assessing academic outcomes addressed one of the substantive goals of the grant. There was no way of getting around this challenge, except to wait for the generation of the report cards. If discussions had been initiated at the grant development phase, it would have been obvious that the evaluation could not have been completed according to the time frame and in the manner intended by the district administrator.

In the case of the New York City grant, due to the inability of implementing the model as outlined in the grant, all quantitative data, except for surveys distributed at training workshops, ended up being derived from external databases. The cause of this was that the grant was not implemented as written and approved and most of the implementation activities outlined in the grant never happened, as explained above.

My only solution was to see what data were available for the three schools in statewide databases that would facilitate assessing the correlates of the grant. After doing online research of available school-level data in New York State, I realized my only hope of rescuing the evaluation strand of this grant was to work with New York City and New York State databases. The data from these databases did align rather well with many of the goals of the program, if not the activities specifically.

Regarding these data, there is a partial "data dump" sometime during the summer, but some data were not available until the second September "data dump." The September data include academic outcomes. Given the grant and evaluation cycles, receipt of the evaluation had been expected by September 1. Academic outcomes are not available until the September "data dump." The Project Coordinator did keep a journal to record real-time events in his interactions with the three New York City schools, which proved to be valuable for narrative purposes. As in the case of the Long Island grant, academic outcomes were a substantive target of the grant so there was a lack of congruence between the annual evaluation deadline and data availability.

A fifth issue related to whether performance indicators are actually measurable by the tools indicated in the grant proposal. A related issue of measurability is whether tools already developed by the grantee that the grantee intends to use in measuring goals, objectives, outcomes, and performance indicators, or tools acquired from other sources are valid and reliable. Many grant writers are not in the position to assess the validity and reliability of tools. Most evaluators should be able to review psychometric tools and protocols to assess whether they are appropriate and psychometrically sound for the project they are evaluating.

Such discussions should have occurred at the level of grant development regarding the best means to measure goals, objectives, outcomes, and performance indicators appropriately. In the case of the New York City grant, there were tools that had been previously developed in-house for the applicant's improvement model. Given the issues that occurred with even getting the project started in two of the three New York City schools and the extent to which dissemination/implementation plans had to be scaled down and modified, these tools were never used, nor was I ever given copies of them to review. For the most part, the performance indicators as documented in the grant were never addressed, and I had to explore other sources of measuring outcomes that I determined were related to the overarching goals of the program.

A sixth issue relates to what extent measurement tools will have to be developed and whether the grantee has the capacity and expertise to do this. Testing and measurement is a discrete aspect of education, and many educators have not had training in nor experience with developing such tools. Educators do generally not take Related courses even at the Master's level. My experience with such

courses occurred only at the doctoral level and only because I had an interest in this area. Regarding the Long Island project, I had to develop four questionnaires (Teacher, Student, Parent, and After-school Violence Prevention Staff) and three interview Protocols (Project Coordinator, CBO, and the LEA). None of these was provided to me. I also had to develop several other questionnaires for the New York City project.

ADDITIONAL OBSERVATIONS

There are other issues of concern related to grant development and the evaluation component that is part of assessing outcomes of interventions proposed in a grant.

Many grant writers may not be aware of the value of the contributions of an evaluator to the grant development process. In the example of the New York City grant, most of the instruments written into the grant were developed in-house for their model, and the evaluator, short of seeing these instruments, could not judge if instruments were appropriate.

When an evaluator inherits an evaluation design, the evaluator is tied to pre-existing "promises" in the approved application. Under only compelling circumstances can an approved grant be refined or amended after approval. Re-funding of grants can be affected by whether the program was implemented as planned and whether evaluation activities were carried out as written into the grant. Therefore, it is useful and informative for an evaluator to be involved from the ground up.

ADDITIONAL ISSUES AND CHALLENGES RELATED DIRECTLY TO DATA

The above conversations dealt with what can happen when the evaluator is not part of grant development. However, there were other issues, related to the data themselves. There were multiple issues related to data collection, quality, and adequacy with both of these projects. Such issues can impact the extent to which we have faith in the outcomes of analyses, both quantitative and qualitative.

First, return rates and missing data can be problematic. With the Long Island project, return rate was important to several analyses. There was a Teacher Survey administered at the beginning of and at the end of the program each year to regular classroom teachers of students involved in the after-school program for their observations of student practices and behaviors related to program goals and objectives. A Student Survey was also administered at the beginning of and at the end of the program for all students involved in the program for self-reports regarding their classroom practices and behaviors as well as out-of-school practices and behaviors. In the second year, a concerning issue arose regarding the Teacher Survey in one school when teachers failed to return pretests. This issue was never resolved. Therefore, about 25% of analyses for pretest/posttest results for regular classroom teachers the second year were lost.

The after-school teachers and the parents/caregivers of students in the program were queried at the end of the program about practices and behaviors of the students relative to program objectives. There were no return-rate issues with after-school teachers and parents. There were three "interview" protocols, one each for the Program Supervisor, the point-person from the CBO, and the point-person from the LEA. The return of the Interview Protocol for the Program Supervisor and the CBO was never an issue but was an issue for the LEA.

There was another issue that required exploration and while unrelated strictly to the theme of this article, it was another unanticipated issue I faced and only I could address it. It dealt with the lack of congruence between the results of the Teacher Survey and the Student Survey. Teacher Surveys consistently showed gains among some of the factors assessed. All the factors assessed on

the Teacher Survey were also assessed on the Student Survey. Student results, on the other hand, showed changes in the wrong direction.

When this continued to happen into the third year, I conducted additional analyses to uncover explanations for this phenomenon. First, I revisited all items on each survey for content validity. Secondly, I ran reliabilities on each of the four surveys – teacher, student, after-school staff, and parent. Thirdly, I conducted correlations on aligned pretest Teacher Surveys and pretest Student Surveys and posttest Teacher Surveys and posttest Student Surveys. Results of all the statistical analyses offered no clear explanation for the results, although the reliabilities for the Student Survey in all cases were lower than for the Teacher Surveys. Teacher reliabilities were high, .855 and .910 (pre and post), and student reliabilities were .832 and .927 (pre and post) on in-school behaviors and between .541 and .700 (pre and post) on out-of-school behaviors related to bullying, fighting, and hitting items. Results of all the statistical analyses offered no clear explanation for the directionality issue.

Finally, I did breakdowns by grade level, thinking that there might be an issue by age, with younger students, third graders, having less reliable responses than fourth and fifth graders. When I conducted a breakdown by grade level of students, there was no basis to support the hypothesis that grade level/age was a determiner regarding lower scores on the posttest than on the pretest for the Student Survey.

Then, I researched articles that dealt with the reliability of the results when younger students take surveys. The articles indicated that results from younger students are generally less reliable than those from older students or adults.

I was left with one hypothesis - that the phenomenon overall was the result of the young ages of the students – and specifically due to one possible cause: 1) that the young students enrolled in the program could have had difficulty at the beginning of the program making reliable assessments of their practices and behaviors without any context for evaluating their own behavior and practices and 2) that exposure to the program had changed their understanding so that they were more judicious and realistic in self-reporting their behavior at the point of the posttest. If pretest results were over-evaluated by students and posttest results were more "realistic," then it was possible to get results that indicated no gain or negative differences. I concluded that perhaps teachers should discuss the response scale with the students and assist students in completing the pretest surveys, taking care not to introduce bias into the responses but to assist students in interpreting items and response choices. If some assistance was required for the posttest, teachers could provide this as well.

In the fourth year of the Long Island program, due to COVID and the closure of schools in March of 2020, the program came to a halt, and the posttest surveys for teachers and students and the parent survey were never administered. After-school teachers did complete surveys. No student grades for the last marking period were available for analysis/comparison. The evaluation consisted of reporting data we had for year 2019-2020, conducting retrospective comparisons with the previous three years of the grant, and offering a holistic four-year perspective on the grant overall.

In the case of the Charter School grant, most assessments intended never occurred. The grant was never implemented as intended. However, there was a pot of gold in the "virtual sphere." Luckily, the New York City School Survey and Quality Review had rich data for all New York City schools, including: 1) a school survey completed by teachers, students, and parents; 2) assessment of school factors based on The Framework for Great Schools Model, a research-based paradigm

which focuses on six components of schooling which foster, support, enhance, and optimize the opportunity for academic achievement, including rigorous instruction, collaborative teachers, a supportive environment, effective school leadership, strong family-community ties, and trust; 3) an overall student achievement index; 4) target levels achieved for the six Framework Elements (not meeting, approaching, meeting, and exceeding); 5) academic measures in multiple Core Course areas and Regents Exam areas; and 6) numerous demographics, including student population; racial breakdowns; gender distribution; percent of ESL/ELLs, special needs, poverty, economic need index; annual attendance rates; percent with 90+ percent attendance; percent of chronically absent students; teacher attendance; and percent of four-year graduation rates. Given my dilemma, these databases were lifesavers.

As a result, assessment of outcomes focused on data available in the New York State databases which included annual academic outcomes, demographic and economic data, and the results of parent surveys by individual New York City schools. What became possible in this set of circumstances was that I could go back in these databases two years prior to the implementation of the grant so that comparisons were possible between pre-grant indices/ratings and those for the years of the grant. Since grant activities were suspended the last year of the grant, it was also possible to compare in combination the two years of implementation with the last year in which there were no activities.

These trend comparisons could result in two important findings: 1) overall, had the schools improved during the period of the grant when compared/contrasted with the two years before the grant, and 2) had the schools held any gains the third year of the grant during which time activities were suspended when compared/contrasted with the first two years of the grant when there were some activities in place.

The only disadvantage was an issue already discussed. This total database was not available until sometime in the month of September. However, given this reality, NYSED permitted me to submit my final evaluation based not on the specified deadline but based on availability of data.

Additionally, what I could not determine, nor would ever be able to determine, was the impact of NYSED mandated improvements implemented in the three schools outside the grant. Did they also explain some of the gains uncovered? Were any positive outcomes and gains the result of mandated activities, of grant activities, or of mandates and grant activities in combination?

ISSUES RELATED TO LACK OF PROVIDING A DESIGN FOR LONG-TERM TRACKING OF STUDENTS

The two evaluations discussed in this paper dealt with issues related to impacting students positively not only for the short term but ultimately for the long term. Both interventions focused on exposing students to opportunities, activities, and reformulation of mindsets and habits that would serve them not only throughout their school experiences but also hopefully into adulthood. Specifically, both grants gave students exposure to opportunities to improve their academic outcomes, to enhance their decision making, to develop cognitive tools to foster social development and nonviolent communicative behavior, to minimize likelihood of dropping out of school, and ultimately to prevent participation in youth crime, violence, and gang activity.

Both grants provided students opportunities to interact in positive ways with caring adults who were tending to "the whole child," cognitively, socially, emotionally, and personally. Both grants also focused on improving student attendance. Additionally, grant activities addressed student

behavior and student engagement, both in school and out of school. Brain-based instructional strategies were employed, social-emotional triggers for students were addressed, and students were introduced to strategies to build resistance to negative peer pressure that they would confront as pre-adolescents (in the case of the Long Island school) and as adolescents (in the case of both the Long Island School and the New York City schools), as well as strategies for developing resilience. Trainers were involved to assist teachers in developing skills that would facilitate positive behavioral changes in students. Teachers were involved in both grants in the change effort. Principals were also involved, either directly or in supportive roles.

These grants were not designed to study a phenomenon, a teaching technique, or the quality of a culture in a moment in time. These grants were designed to change the present and future lives of these students through interventions. In that vein, while the grants were designed to address long-term effects for students, no provision had been set up for tracking students longitudinally. Inasmuch as these grants were designed to improve opportunities and life chances for these students, the schools involved should have also integrated into their planning a mechanism for tracking these students in the long term, at least to the point of high school graduation. Even if it were to be too onerous to track all of them, a representative cohort could have been identified to track a sample of the students

LESSONS LEARNED

For several years, I have wanted to write about my experiences with these two grants as the evaluator of these programs. I have been conducting evaluations for close to 33 years. In my experience, most practitioners do not have expertise in evaluation processes and techniques. Evaluation is a specialty unto itself. Each evaluation has its own challenges, "personality," and twists and turns. Those who write grants know their needs and purposes. What they often do not have experience with and expertise in is the science of evaluation.

A valuable lesson I learned is that people do matter. I had incredible support from the Central Office Administrator and the Program Supervisor at the Long Island schools for the three years discussed. Likewise, I developed a close working relationship with the Project Coordinator at the New York City Charter School. I worked closely with all three as colleagues, developed instrumentation for them when needed, discussed best ways to address issues, and received feedback regarding my work.

Another lesson learned involved the transition from the contents and rubrics of the approved grant application to the actual work for the evaluator that entailed moving from the original assessment plan (or lack thereof) to appropriate, real-life data generation or acquisition of data to meet specifications as set out in the grant – and the frustrations for the evaluator that this transition created.

In the case of the Long Island grant, I had to develop questionnaires and access student report cards to assess outcomes. The evaluation design for the Long Island grant had challenges, but it was not as unmanageable as the New York City evaluation design.

In the case of the Charter School grant, for each objective there was a list of data-collection methods, with no connection to individual measurable objectives. I was able to address this by reconceptualizing goals and creating a means of linking measurable objectives to performance indicators, even though I had to use external data sources, different from those originally intended, to complete the final evaluation. Luckily, there was alignment between data we would have wanted to collect within the schools and data that were warehoused in New York State databases.

The issues described in this article underscore the need for grant applicants to involve an evaluator in planning at the point of grant development. An experienced evaluator can assist grant developers with alignment of goals, objectives, activities, outcomes, and performances indicators, as well as with issues related to accessing or developing valid and reliable tools for data generation. In other words, an evaluator can serve as a steward for "problem anticipation."

The final lesson learned is that being proactive is better than being put in the position of being reactive. A corollary is that there may be times that evaluators must be prepared to be resourceful when everything is falling apart.

POSTSCRIPT

Since my completion of the work of the two grant programs discussed so far, I have had the opportunity to work on three new grants, starting in the summer of 2021. Prior to my interview with this agency for consideration to be the evaluator of these grant programs, I shared the paper that I had presented at the ISEP conference in Lisbon in October of 2019 that led to this article.

From the outset, the point people at the agency took a serious look at the issues I had raised in my presentation. I believe that I was hired based on the content of that presentation. From day one, after I was hired to evaluate their grants, I was included in team meetings and in all advisory council and professional development offerings. I have been considered a part of their "team." We have collaborated on all assessment activities, and I have been part of all team planning.

These professionals had a true understanding of the challenges involved in evaluation activities once they understood how evaluations are supposed to be conducted within a grant structure, have supported me in every way possible, and were truly interested in making the most of the processes of assessment and evaluation. Their grants were exemplars, and it was easy to move from goals to objectives to activities to outcomes to performance indicators so that assessment tools could be developed.

They were sensitive to the need to measure what had been "promised" in their grants and made certain that there was fidelity to these promises and that everything that needed to be assessed was assessed in ways that would generate valid, reliable, and useful information. While I was not part of the original discussions regarding what the measurement tools would be for the programs, in the end I was responsible for designing almost all queries and questionnaires. I trust that in the future this agency will bring an evaluator into the planning and design stages of funded programs. I am assured that they are now aware of the value of keeping the evaluator close, from start to finish.

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EVALUATION OF INSTRUMENTS THAT MEASURE SCHOOL BUILDING CONDITION

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ABSTRACT

This manuscript contains a discussion of the evaluation of survey instruments used in research studies to assess the influence the school building has upon student and teacher performance. Under the assumption that the school building influences student and teacher performance, it is necessary to determine the actual physical condition of the school buildings. To determine the condition of the school building, a variety of instruments have been developed and used. Roberts (2017) has recognized these instruments as being in two categories. The first category are the instruments developed by researchers specifically to determine the condition of the school building. The second category of instruments are the maintenance type instruments that are mainly used to determine building needs for the upkeep of the building. The second category measures needed repairs and improvements need to keep the building in good condition. This instrument may or may not contain the measures of those building elements or features that directly relate to student learning.

Cash (1993) developed the Commonwealth Assessment of the Physical Environment (CAPE) for one of the early studies on the influence of the school building. She also validated the study by using principals not involved with the study to assess the instrument. To date this has been the only validation of an instrument designed to measure the condition of a school building. A listing of the various instruments that have been used in research studies is contained in the Appendix.

INTRODUCTION

For almost half of a century, educational researchers have been investigating the possible relationship between the physical environment, as represented by the school buildings and classrooms, and the health, attitudes, and performance of students and teachers. In this period of time, the findings of successive research efforts have demonstrated that there is a positive relationship between the two variables. These findings indicate that if a school building is in satisfactory condition the students will perform academically much better than if they are in a building that is in unsatisfactory condition.

Some of the earliest studies were those that used the age of the building as a variable to indicate the influence of the structure has upon student performance (Blincoe, 2008; Chan, 1979; Chan, 1980; Garrett, 1981; McGuffey & Brown, 1978; Phillips, 1997; Plumley, 1978). These researchers found that students in older buildings performed less well than students in new buildings. The age of a building, however, was not the reason for poor student performance, but rather those building components and features that the older buildings lack, but which new building possess, was the reason for the significant difference in student achievement scores. The building components vital for positive student learning were absent in the older school buildings

The next research efforts went beyond using the age of the building as an independent measure and instead used an assessment of the condition of the building as the variable that might influence student achievement. In these studies, the building condition was represented by an assessment of various building components and features that previous research had indicated had

a relationship to the health and performance of the users of the space (Cash, 1993; Crook, 2006; Earthman, Cash, & Van Berkum, 1995; Hines, 1996). For instance, the thermal environment is an especially important aspect of a good physical environment. This building component has been used in many studies to assess its effect upon the health and performance of the occupants of the space. Therefore, this would be an important item to assess in determining the condition of the building. There are other building components that have been used in research studies to determine the effect upon the users of the space. These items have been condensed into school building assessment instruments that are used to determine the total condition of the school building for research purposes to find any possible effect.

The field of study under consideration in this discussion encompasses the research conducted to investigate the possible influence the condition of the school building has on student and teacher performance and attitudes. The second consideration is an examination of assessment instruments used for maintenance purposes, yet in some cases have been used in research studies. These two types of instruments have served the needs of researchers and school authorities to ascertain if the condition of the building has any influence upon those individuals within the school buildings and also the school buildings are in serviceable condition.

This is a rather narrow scope of investigations, but an especially important one because the research results impact upon human behavior. The results of the many investigations into this subject have indicated a positive influence that the physical environment, as represented by the school building, has upon the individuals who work and study in that environment. The end result of such research investigations is to use data to inform school authorities of the need for improvement of the physical environment of students and teachers to increase performance.

Naturally, one the of requirements of this type of research is the use of instruments in gathering data on the condition of the school building. In effect, the condition of the school building is essential if a determination is to be made of possible influence. In addition, there is a need to identify needed repairs in the school building for maintenance purposes.

In reporting to the Supreme Court of British Columbia in a deposition, Roberts (2013) delineated two types of school building evaluative instruments. The first is the maintenance or engineering type of instrument. This instrument is designed to identify those repairs or replacements needed to keep the school building in good working condition. The second type was termed a mission instrument mainly used in research studies. Items in the mission type of instrument normally have a research base indicating that some research has been completed to verify that there is a positive direct relationship between a certain building elements and student achievement. This has been done through a comparison between the building element and student achievement.

Because some researchers have used data derived from maintenance/engineering type evaluative instruments in research studies, it is incumbent to include such instruments in any discussion of instruments used to ascertain the condition of a school building for research purposes.

MAINTENANCE AND ENGINEERING INSRUMENTS

Instruments that measure and record the maintenance problems of a school building should be utilized for just the purpose of identifying all the building elements and machinery that needs some attention or re-placement. The success of the instrument in identifying all the repair/ replacement needs of the school building is in doing just that. There is no need to validate such

an instrument. If building elements that need repair and were not identified by the instrument in a maintenance inspection, the proper thing to do would be to add additional questions or items to cover what was missed.

The same rationale applies to so-called engineering instruments. These are evaluation instruments that are produced by an engineering firm for the purpose of determining if the building is sound and in good working condition. Such instruments may well evaluate parts of the building structure that annual maintenance evaluative instruments may not cover. The soundness of the foundation of the school building may be assessed in an engineering-type of instrument that may not be assessed by a maintenance-type of instrument. The need to replace the heating is another item that may or may not be included in the annual inspection. Nevertheless, there is a need for engineering instruments to evaluate parts of the building that a maintenance-type instrument may not include. As like the maintenance-type of instrument an engineering evaluation instrument cannot be validated as to effectiveness or reliability. The instrument either assesses everything that it is supposed to evaluate, or it does not and needs revision.

Data derived from maintenance and engineering type of evaluative instruments have been used in several research studies to ascertain the condition of the school building (Duran-Narucki. 2008; El Nemr & Cash, 2022; Gravelle, 1998; Pirus, Marlon, Calvo, & Glenn 2005). Such use of data from a maintenance instrument has in effect compromised their findings. Researchers of such studies usually state that the results of their analyses may not be as robust as other researchers or that there is no difference between achievement scores of students in building rated as either in satisfactory or unsatisfactory condition.

. There is no need to validate a maintenance or engineering type of instrument for several reasons. The first reason is the necessity of adding items to the instrument to measure a particular building element that is present one year and not another year. For instance, while assessing the building for items that need to be repaired or replaced a particular feature may not be on the instrument and is simply added when observed. The addition of new items for the instrument in essence means a different instrument. Secondly, the instruments do not measure the same item consistently. In other words, the maintenance/engineering type instrument is designed to identify needed repairs, but not necessarily the same item on each inspection. Undoubtedly there are some items included on the instrument that are standard but may not cover all possible needs. The worn-out carpeting may appear only once on the instrument or may not even be identified as a particular item but is added to the data collected by the instrument. If in the annual evaluation of the school building some items of need of repair are not identified, the reason would lie with the individual doing the evaluation and not the instrument itself.

MISSION TYPE EVALUATION INSTRUMENTS

The other type of school building evaluation instrument is what Roberts (2013) refers as a mission type instrument. Such instruments are especially designed to evaluate the elements or features of the building that previous research has indicated have a positive influence upon student achievement. Such features as positive thermal control of the classroom (Air Conditioning, Air Quality, Heating/Cooling), the necessity of good lighting, acoustical control in the classroom, proper classroom furniture, cleanliness, and proper toilet facilities are essential to positive student learning and teacher attitudes (Earthman, 2004). The measurement of these building elements or features are normally included in mission type building evaluation instruments and essential if usable data is to be obtained for research purposes. See the Appendix for listing of such selected instruments.

Cash (1993) may have been the first and probably the only researcher to try to validate a mission type of instrument The instrument she attempted to validate was the Commonwealth Appraisal of Physical Environments (CAPE). She utilized the CAPE to determine the condition of the middle schools in Virginia and then compared the academic scores of students in these schools to determine significant difference in scores. She found significant differences in achievement scores of students in school buildings rated as being in either satisfactory or unsatisfactory condition.

In an effort to validate the CAPE, Cash asked five principals who were not in her study to assist in the validation process. Each of the five principals completed an assessment of their school building using the CAPE. Cash also evaluated the high school building in which she was principal. Her responses were measured against the results of the five principals. The results of the evaluations were remarkably similar, thereby providing a measure of reliability that the instruments provided similar data. This validation exercise seems to be the only validation of the CAPE that is known.

Other researchers have used a modified version of the CAPE to identify the condition of school buildings in either satisfactory or unsatisfactory condition, (O'Neill, 2000; Phillips, 1997; Plumley, 1978). No validation processes were reported in these studies. In 2019, Earthman revised the CAPE to include items related to newer classroom technology. The Revised CAPE has not been validated and needs to be validated.

In 2022, El Nemr and Cash utilized the Revised CAPE in a study of schools in Virginia. They also used the Facility Condition Index (FCI) as a measure of building condition. The FCI is not noted for accurate measurement of the physical condition of the school building, because it is a ratio of the cost of maintenance needs of the building to the total value of the building. El-Newr and Cash used the FCI in conjunction with the Revised CAPE in an effort to ascertain the condition of the school buildings in the study. The findings of the study were not as robust as other studies that did not include an engineering type of instrument to measure the condition of the school building. The Revised CAPE is now being utilized in a study currently underway achieving much improved results.

Some researchers have performed validation exercises on the instrument designed to record teacher or student attitudes. These studies used either the CAPE or a modified form of the CAPE or indeed a different instrument to ascertain the condition of the school building. The researchers of these studies then used the data on school building condition to determine if there was a significant difference between attitudes scores of students in these two categories of school buildings.

One of the earliest studies examining the relationship between school building condition and student/teacher attitudes was conducted by Karst (1984). He investigated the possible relationship between school building quality and student and teacher attitudes in a large metropolitan area in Louisiana. The population consisted of 499 students in six elementary, junior high, and senior high school buildings. A total of 130 teachers also participated in the study. The condition of the school buildings was assessed using the Model for Evaluation of Educational Buildings (MEEB) developed by Carroll McGuffey & Brown (1978). Based upon the assessment, the buildings were divided into upper and lower quality buildings, based upon the scores assigned by the assessors.

The attitudes of the students and teachers were assessed providing data for a comparison between the two groups. The assessment instrument used to measure attitudes was simply referred to as E-4 and E-10 without further identification or description. The E-4 was administered to teachers and the E-10 to the students. There was no validation of the MEEB instrument. In addition, the MEEB could be classified as a maintenance type of instrument

Leigh (2012) also investigated the relationship between the condition of the classroom and teacher's attitudes about their classroom. He utilized the Revised Commonwealth Assessment of the Physical Environment (RCAPE) to classify the school buildings as either in satisfactory or unsatisfactory condition. The instrument used to measure teacher attitudes was the My Classroom Appraisal Protocol, (MCAP) (Earthman, 2004) and was administered to the teachers. Results of the CAPE building evaluation and MCAP were subjected to a t-test to determine significance. There was a significant difference between the attitude scores of teachers in the two categories of school buildings indicating school building condition had an influence upon teacher attitudes.

As part of the study Leigh then determined content validity of the MCAP by asking all teachers in three school buildings to respond and complete the instrument. At the same time teachers were asked to complete an assessment of the instrument for purposes of future administration. Revisions to the items resulted from this exercise. A Cronbach Alpha was completed on the results of this administration of the MCAP and a Cronbach alpha of .84 was found indicating a high level of reliability. The CAPE instrument was not validated.

Another validation of a teacher opinion instrument was completed by Uline, Tschannen-Moran, et. al., 2006). The instrument they validated was the School Climate Index which was designed to measure teacher attitudes about the condition of the school building in which they were teaching. The Cronbach alpha was not reported.

These are the only validations of instruments used in research efforts relating to the relationship between school building condition and student or teacher attitudes that are recorded. Perhaps there have been other validation of instruments, but none recorded to assess the condition of school buildings for research purposes, which is quite different.

Use of data on the condition of a school building derived from a maintenance type instrument for research purposes may not produce the same results as data from a mission type of instrument might produce. These instrument, however, have been used in research studies with some degree of success. That said, the instrument must contain some items that are directly related to student achievement or attitudes. As an example, Gravelle (1998) evaluated the school buildings in Idaho for a research study. She utilized the Building Condition and Suitability Evaluation (BCSE) instrument produced by the Department of Education. The instrument had 60 items to be scored by the principal of the school building. This instrument could be termed an engineering-type of building evaluation instrument according to Roberts (2013). Gravelle did find significant differences in student achievement scores between students in satisfactory or unsatisfactory school buildings. Her findings, however, were not as robust as found by Cash (1993), Hines (1996), Earthman, Cash, & Van Berkum, (1995), Crook, (2006), who used a mission-type instrument (Roberts. 2013).

Gravelle (1998) indicated that the instrument was very thorough, but that many of the items did not relate directly to student learning. This finding would seem to indicate that those items in the instrument that did not relate directly to student achievement tempered the final results of her study. Gravelle might have found stronger results if she had utilized the results of only those items that did directly relate to student achievement as a measure of building condition.

The findings of another researcher were similar to what Gravelle found. In 2008, Darwin-Narucki conducted a research study to determine if the condition of the school building influenced both student attendance and achievement. Her study was conducted in the New York City Public School System using the elementary schools. She also used the engineering type of evaluation

instrument produced by the public school system. In spite of the fact such instruments, in many instances, do not produce the same kind of data as mission type instruments, she did find that the condition of the school building influenced both student attendance and achievement. There was a significant difference in attendance rates and in achievement scores of students in satisfactory and unsatisfactory school buildings.

The same results were not found by Picus, Marion, Calvo, & Glenn, (2005). in their study of the school buildings in Wyoming. The researchers, in order to ascertain the condition of the school buildings, used an evaluative instrument developed by the MGT engineering firm. The instrument was the usual type of engineering instrument that measured many building elements that were not directly related to student achievement, such as the integrity of the foundations, the quality of the carpeting, or the quality of the wall treatment, for example. The researchers could not find any significant difference in achievement scores of students enrolled in either satisfactory or unsatisfactory school buildings. Unfortunately, the researchers reported the school building condition did not influence student learning. There were other aspects of the study, besides the use of an engineering instrument, which were dubious. The superintendents of each school district evaluated the local school building to determine the condition of the school building. Brannon (2000) found that the principal of the individual school building was more informed about the condition of the school building than the superintendent or any other school official. Also, Picus, et. al (2005) used student achievement scores that were averaged over a three period of time supposedly to better represent the achievement of students. Naturally, the means of student grades over a three-year period of time is not representative of the student grades received in the exact year in which the study was completed. These factors might also have compromised the findings of the researchers.

VALIDATION

Validity is the action of checking or proving the validity or accuracy of something. Another definition is: The determination of the degree of validity of a measuring device. In other words, actions to determine if an evaluation instrument measures what it is intended to measure. In the field of school buildings such an instrument would be an instrument that determines the usability of the building for educational and research purposes.

With the advent of recent research regarding the possible influence the school building has upon the performance of students and teachers a different type of assessment instrument was developed. It was not until 14 years later that other researchers seriously started the research effort to determine the influence the school building has upon the students. (Cash, 1993; Edwards, 1993). Since that time serious researchers have completed several studies to ascertain what the existing research has found to be the case in this area, (Bailey, 2009, Hewitt & Earthman, 2017; Lemasters, 1997; Weinstein, 1979). These studies have been reviews of research investigating the possible influence the school building has upon student and teacher attitudes and performance. In the latest such research review, Hewitt & Earthman (2017) identified 103 different studies related to this topic. Eventually they used thirty-six of the studies where a mission type of instrument was used to determine the condition of the school building and directly related to the possible influence a school building has upon student achievement for their analysis. All of these studies reported a significant difference between achievement scores of students enrolled in satisfactory and unsatisfactory school buildings.

With such a plethora of studies in this area of research, the thought of validation became an issue. Should the instrument used to obtain data on student and teacher attitudes and achievements be validated? Likewise, should the instrument utilized to obtain data on the physical condition of the school building be validated. The issue never became a prominent issue with researchers. The matter of validation of the CAPE could hinge on the repeated use of the instrument arriving at the same results as was the case in the original study by Cash (1993). Repeated successful use of the CAPE could indicate a reliability validation. This in effect could be considered at least a reliability check of the CAPE after repeated results.

COHORT DETERMINATION

In addition to the application of the proper data gathering instrument to determine the condition of the school building, there is the matter of determining the cohort of school buildings to be compared to ascertain if there is a significance difference between achievement scores of students in satisfactory or unsatisfactory school buildings. This regards the determining of school buildings as being either in satisfactory or unsatisfactory condition. In all instances the instrument used to ascertain the condition of the school building has a scale that provides data on the condition of the building and results in a final score for each building. These data then can be utilized in comparing each building condition with student achievement scores.

The final score of each building in the study is normally arrayed in some ordinal position on a scale ranging from bottom score to top score. After the final score of each school building is displayed in the list, the researcher must decide which school buildings can be classified as being in either satisfactory or unsatisfactory condition. The division of school buildings ranked between satisfactory or unsatisfactory can be a matter of personal judgment. Normally the top half of the scale should contain the scores of buildings in satisfactory condition and the bottom half of the scores would indicate school buildings in poor condition. Yet there is a graduation of scores from the bottom score to the top score. As rational as that ranking may seem, there is a very little difference between the school building listed as number 49 and the school building listed as 50, consequently there is little difference in school building scores at that point to divide the schools into either satisfactory or unsatisfactory condition. Comparing the student scores in these buildings then results in little difference or possibly no significant difference. The school building scores in the two middle quartiles in effect moderate the scores of the school buildings in the bottom and top quartile resulting in a compromised school building score for the two bottom and top quartiles.

The better strategy in comparing scores of school buildings would be to take the top and bottom quartile of scores and made a comparison between these two groups of school buildings. The rationale for this strategy is that the extreme of the scores of school buildings represent the best and worse condition of the school building and would better show the effect of the condition of the school building on student achievement. Using the extreme positions would be a better comparison and possibly result in a significant difference. Whereas comparison of the entire cohort of school building scores in the top and bottom halves would marginalize the effect of the condition of the school building.

The researchers of most studies employing the comparison of school building condition to student scores methodology do not stipulate how the division of school building scores is determined. It could well be that the researchers are using the top and bottom halves of building scores as the two

cohorts for comparison rather than using top and bottom quartile of scores. Again, this would result in the marginalization of the effect of the school building condition. Thus, the researchers might then stipulate there is a weak correlation or no correlation at all. This would then be an error that would result in reporting doubtful findings.

SUMMARY

Over the course of more than half a century, there have been many evaluative instruments developed to measure the condition of the school building for research purposes. Some of the instruments have been very effective in measuring the exact condition of the school building for research purposes. Likewise, there have been some instruments or derivations of instruments that have not proven as effective as other instruments.

There also have been some researchers who have utilized data from maintenance/ engineering type of instruments to measure the condition of a school building for research purposes. The results of these studies have been mixed at best. Gravelle (1978) and Duran Narucki (2008) employed maintenance type of instruments and found a degree of evidence that the condition of the school building did have an influence upon students. The same cannot be said for the Picus, et. al. (2005) study. There were, however, other features of the study that might have influence results, such as having the superintendent of schools evaluate the school buildings rather than the individual principals. The averaging of student achievement scores over a three-year ceroid might be another compromise in this study.

The question always rises regarding a need for new instruments. The fact is that new instruments to measure school building condition for research purposes are not needed. This is because there are several instruments on the market that will measure the building condition accurately. The secret to effectiveness remains with the composition of the instrument. If the instrument contains items that have a research basis and accurately measure the building feature or element that directly influences student/teacher performance, it will produce the data needed for the study.

Some of the maintenance/engineering instruments used in research studies may contain sufficient items directly related to student learning, but the items in the instrument that report needed repairs or replacements tend to minimize the effect of the research-based items with resulting questionable data.

The conclusion of this manuscript is, however, that for best results of studies trying to determine the possible influence school building condition has upon student or teacher performance or attitude is to utilize a mission type of instrument where the items on the survey instrument are directly related to student academic achievement.

In the Appendix, some of the more useful evaluative instruments are listed according to the category of research. This may not be the most exhaustive list, but it does list the better-known instruments that have been utilized. The list contains those instruments that measure the condition of the school buildings. Also contained in the list are those instruments designed to gather data on student and teacher performance and attitudes. Finally, there is a list of maintenance/engineering type instruments that have been used in research studies.

APPENDIX

Evaluation Instruments Utilized in Research Studies

Building Condition
Guide for School Facility Appraisal (Hawkins & Lilly, 1992)
Model for Evaluation of Educational Buildings, MEEB (McGuffey, 1974)
*Commonwealth Appraisal of Physical Environment CAPE (Cash, 1993)
The Design Appraisal Scale for High Schools – DASH-1 (Anderson, 1999)
State Assessment of Facilities in Education SAFE (Earthman, 1995)
Assessment of Building Conditions in Elementary Schools, (Lanham, 1999)
Commonwealth Appraisal of Physical Environment Revised CAPER (Cash & Earthman, 2016)

Teacher Attitudes
**My Classroom Appraisal Protocol (Earthman, 2006)
National Classroom Appraisal Protocol (Earthman, 2005)
**The School Climate Index (Uline & Tschannen-Moran, et al. 2006)
Teacher Opinion of Physical Environment (Lemasters 2006)

Student Achievement & Attitudes
Student School Building Assessment Scale (Earthman 2008)
Our School Building Attitude Inventory (McGuffey, 1971)

Maintenance/Engineering Type Assessment Instruments that usually do not measure building condition
Building Condition and Suitability Evaluation (Idaho State, 1998)
CDW-G 21st-Century Classroom Assessment Tool (CDW, Ryan Kurtz)
Design Assessment Scale Elementary (2000)
Building Condition Survey-NYC (Duran-Narucki, 2008)
MGT (Picus, et.al, 2008)
Facility Condition Index (US Accounting Office, 2009)

*This study is the only one that has been validated and measures building condition
**These studies have been validated, but measure student/teacher attitudes

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SCHOOL FACILITY I.Q. INVENTORY (SFIQI): AN ESSENTIAL TOOL FOR SCHOOL FACILITY MANAGEMENT

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ABSTRACT

This article is on the development of the School Facility I.Q. Inventory (SFIQI), an instrument to assess the extent of knowledge a school administrator possesses in delivering their assignment to manage his/her school building. The instrument was designed based on the current literature. The validity of the instrument was verified by a panel of judges and its reliability was tested by using split-half reliability method. Embedding eight themes on school facility management, SFIQI consists of five sections with a total of 71 quantitative questions. The instrument can be used for self assessment of a school administrator's knowledge about school facilities. It can also be used as a teaching tool in the school leadership preparation programs.

INTRODUCTION

School principals play many roles in their daily duties serving as the heads of schools (Chan, Jiang, Chandler, Morris, Rebisz, Turan, Shu, & Kpeglo, 2019). Their major roles are instructional leadership and business management. While instructional leadership is focused on effective teaching and learning, business management includes personnel, finance, community relations and school operation (*School principal job description*, 2022; *The building principal - My Tennessee public schools*, 2022). The focus of this article is on how the school principals maintain their school facilities in operation as their daily duty. How much do they need to know about their school buildings to maintain their smooth opening to serve the education purpose?

REVIEW OF LITERATURE

Preparing Principals to Manage School Facilities

Most of the candidates in the school principal preparation programs have only limited knowledge and background of school facilities. They know very little about the principals' roles and responsibilities in managing school buildings. Therefore, it is absolutely necessary that the preparation programs include at least one course offering on school facility management so that these candidates can be well prepared to deal with school building issues (Chan, Patterson, Tubbs, Holliday, Terry, & Rowe, 2007). Educational leaders assigned to open up new school buildings are usually faced with unexpected facility challenges (Chan, 1983; Chan, 2001; Chan & Ledbetter, 1999). They also need to be prepared to handle new school building problems by going through the proper channels.

School Facility Management

The planning of school facility management involves a targeted practical plan supported by sufficient resources and appropriate personnel (Chan & Richardson, 2005). It also calls for a system of supervision and evaluation for the planning effort to be effective (Chan, Whitson, McLeod, & Bessette, 2005; Kowalski, 2002). Bessette, Bowen and Chan (2006) also recommended a team approach to school building management which involves the administrators, the custodians, the teacher representatives, the student representatives and the parent volunteers. They claimed that the team effort is the best collaborative approach to school facility management.

School Building Maintenance Program

An effective school building maintenance program could prolong the life expectancy of a school building (Castaldi, 1994; Earthman, 1994). The school administrators and staff need to work with the school district maintenance department to make best use of the available resources to achieve the best purpose of keeping the school building in excellent shape (Tanner & Lackney, 2006). An accurate record of all school building data has to be well kept and accessible for emergency use. Serious consideration has to be given to the extent and frequency of application in all areas of school maintenance (Davis & Loveless, 1981; Herman, 1995). Chan (2000) claimed that the school maintenance program has to start from day one when the new school building is turned over to the school district. The conditions of a new school building begin to run downhill when it is first opened. An effective maintenance program will slow the downhill process.

School Building Capacity and Utilization

A school principal needs to have good record of the capacity of the school building he or she is administering. He or she also needs to have knowledge of all the spaces and their usage in the school building. Many states require that school principals report the school capacities and space utilization in their annual performance assessment (U.S. Department of Education National Center of Educational Statistics, 2007). In determining the capacity of a school building, consideration has to be given to program requirements, sizes of spaces and the functions of utilization (Chan, 1997a). Different states have their individual formulae for the calculation of school building capacity and its utilization (Chan, 1997b).

School Portable Classrooms

Portable classrooms are often placed in overcrowding schools to help provide additional capacities to house the student population. However, portable classrooms are usually perceived by the public as second quality instructional space (Patterson, Chandler, Jiang, & Chan, 2009). School principals have the responsibility to support teachers teaching and students learning in portable classrooms and turn portable classrooms into positive instructional spaces (Chan, Patterson & Chandler, 2009; Chan, Tubbs & Jiang, 2005).

School Safety and Healthy Environment

School as a facility to house teaching and learning has to be designed safely and healthily to be a positive environment (Chan & Dishman, 2011). A new school building has to pass the county/city inspection for safety and health conditions (Crisler & Chan,
2007). Under the leadership of the school principals, school buildings need to be maintained at a high level of safety and healthy practices to meet the building, fire, and sanitation codes (Schneider, Walker, & Sprague, 2000).

School Aesthetic Environment

An aesthetically beautiful design school is a positive environment for teaching and learning (Earthman, 2013; Kowalski, 2002; Tanner & Lackney, 2006). It displays the love and care of the designers and the educational planners for the teachers and students (Chan, 1988; Jarman, Webb, & Chan, 2004). Beautiful school buildings are taken as a pride of the community where they are located. They often win strong support of the community (Kowalski, 2002). School principals and the custodial staff can help maintain the school buildings looking beautiful inside and outside (Strickland, & Chan, 2002).

Green School Leadership

Energy conservation and preservation in school buildings have been advocated by many planners and designers for a long time (Earthman, 2013; Kowalski, 2002; MacKenzie, 1989; Tanner & Lackney, 2006). School principals play a unique role in administering the sustainable energy conservation program and supervising the application of such practices (Chan, Saunders & Lashley, 2015). Green school principals can make the connection among green school practices, student achievement, healthy school environments and project-based learning (Blendinger, Hailey & Shea, 2015; Carrick & Caywood, 2015; Lemoine, Mense & Richardson, 2015; Wolsey, 2015). Putney, Morris, and Sargent (2015) also promote school principals' effort toward designing green school curriculum to transform the schoolhouse and classroom.

THE SCHOOL FACILITY IQ INVENTORY (SFIQI)

Description

The School Facility IQ Inventory (SFIQI) is an instrument developed to measure the extent of knowledge a school administrator has in relation to issues concerning the school building he or she is administering. It is an instrument constructed by the author with reference to current literature, field practices and city/county and state regulations. It consists of eight sections with a total of 71 quantitative questions. A two-point scale is used for scoring answers to all the yes/no and true/false questions. Principals' demographic information is also solicited for useful references. (See Appendix 1)

Theoretical Framework

Kerlinger (1986) and Rychlak (1968) provided a description of theory as a series of two or more constructs, abstractions, concepts, variables, definition, and propositions, which are interrelated and developed with a systematic view of phenomena. Since the SFIQI underdevelopment is facility related, it is evident that concepts, constructs, and variables will be involved in the content identification process. Therefore, the definition of theory by Kerlinger and Rychlak fits in well in support of the construction of this instrument.

Underlying Themes

There are eight underlying themes in this instrument consisting of building demographics, educational orientation, policies, procedures, security, safety, healthfulness, and aesthetics. These themes are derived from the review of literature. They represent the major areas of a school building a principal needs to know and do. (See Appendix 2)

Building demographics – The basic demographics of the school building such as square footage, number of classrooms, student capacity, and room assignment need to be properly recorded and conveniently filed for timely use.

Educational orientation - The principal needs to understand the fundamental functions of a school building. Each instructional area is designed with special features to serve the particular purposes of teaching and learning.

Policies – School district policies in relation to school building management need to be closely observed. School principals need to work with his/her custodians to ensure that all the county or city building codes are strictly followed.

Procedures – In the management of school buildings, principals need to be very familiar with the procedures of how school building issues are handled. The assistant principals and the head

custodians could be assigned with specific management responsibilities so that they all know the different channels of getting things done.

Security – The security of a school building is a big concern of parents who have children in school. An efficient and effective security system needs to be installed and to be in proper operation in school. All the school administrators, teachers and staffs need to understand how the system works just in case of emergency.

Safety – When a new school building is completed, it is inspected for meeting all the building codes and fire codes. However, these school safety features have to be properly and frequently maintained to be functional. The school administrators have major responsibilities to understand and supervise that these safety designs are in place.

Healthfulness - To serve the educational purposes, a school building has to be kept in excellent healthful conditions. Indoor air quality and water quality are the two biggest community concerns. School administrators and staffs need to develop a systemic plan to check on the sanitation environments and to maintain them at the highest standards.

Aesthetics - The school building as a teaching and learning environment can be kept aesthetically pleasing. The community enjoys working with the school administrators and staff to maintain the school building as a beautiful and lovely environment for the children.

Validity and Reliability

The contents and the division of the instrument were organized with reference to the current literature on school facility planning and management. The initial draft of the instrument consisted of eight divisions of seventy-five questions soliciting school principals' responses to True/False and Yes/No items. A panel of judges was established to confirm the validity of the instrument. The panel consists of three school principals (one from each school level), three school custodians (one from each school level), a school district maintenance official, and a school district facility planning director. The judges were asked to examine the instrument in terms of its relevant contents, language appropriateness, measuring format and scoring methodology. As a result of the panel discussion, eight items were deleted from the original draft and three new items were introduced. Therefore, the revised instrument consists of seventy-one items embedded in eight divisions. Slight modifications were also made to the language of the instrument as recommended by the panel of judges.

The reliability of SFIOI was determined by employing the statistical procedure of split-half reliability. As described by Warner (2013):

> This is a type of internal consistency reliability assessment that is used with multiple-item scales. The set of p items in the scale is divided (either randomly or systematically) into two sets of p/2 items, a score is computed for each set, and a correlation is calculated between the score on the two sets to index split-half reliability. (p. 1117)

The test application involved fifteen school principals, five from each of the three school levels. The responses of the school principals were split into two halves, the singular half and the even half. Spearman's Correlation Analysis was used to examine the correlation of the two halves of responses. The result of the analysis showed a correlation coefficient of .765 indicating an acceptable level of internal consistency of the instrument.

Scoring System

A two-point scale is used to score the answers to the 71 quantitative questions. The answers to the questions are designed to be either "True" or "False" and "Yes" or "No." The correct answer to each of the "True" or "False" and "Yes" or "No" questions are awarded 1 point. The incorrect

answer to each of the "True" or "False" and "Yes" or "No" questions is awarded 0 point. The total highest score that could be attained is 71 and the lowest score is 0. An entire list of all the correct and incorrect answers and their corresponding scores is included in Appendix 3.

INTERPRETATION OF RESULTS

School leaders who check the extent of their knowledge about their school buildings by using the School Facility IQ Inventory (SFIQI) will result in getting their total scores calculated. Additionally, each of the school facility area score will also be calculated. These eight areas are building demographics (17 items), educational orientation (6 items), policies (10 items), procedures (26 items), security (6 items), safety (24 items), healthfulness (12 items) and aesthetics (8 items). (See Appendix 2) The school leader's school facility IQ level is determined by using percentiles over the total scores. Leaders who score between 25th and 50th percentile are classified as achieving at a low school facility IQ level. Leaders who score below the 25th percentile are classified as not meeting the standard of a low school facility IQ level. Leaders who score between 50th and 75th percentile are classified as achieving at an average school facility IQ level. Leaders who score between 75th and 100th percentile are classified as achieving at a high school facility IQ level. (See Appendix 5) In each of the eight school facility areas, if a school leader gets less than half of the answers right, he or she is considered to be at a low school facility IQ level in that area. If a school leader gets more than half of the answers in each area correct, he or she is considered to be at an average or a high school facility IQ level in that particular area. (See Appendix 4)

SIGNIFICANCE OF THE INSTRUMENT

The SFIQI instrument is designed as a test on the school facility knowledge level of school leaders, particularly school building administrators who are assigned with fully responsibilities of managing the entire buildings. The result of the test will indicate their total score and each of the school facility area scores. It is a good way to display all the areas of strengths and weaknesses about their school facility knowledge. Consequently, school administrators will identify areas that they can continue to work on to become good school building managers.

The SFIQI can also be used as a self-assessment tool of school facility knowledge a school administrator possesses. School administrators are considered as instructional leaders of schools. Many of them are not aware of the school facility knowledge they need to have to serve as school building managers as well. The SFIQI helps to remind them of the aspects of their school building responsibilities they could possibly overlooked.

CONCLUSION

The School Facility IQ Inventory (SFIQI) is designed to identify the school facility knowledge level of school administrators who are assigned as school building managers of their schools. The instrument also helps display school administrators' strengths and weaknesses of their knowledge in certain school facility areas. School districts could adopt the instrument as a required check on school administrators' knowledge of school buildings before they are assigned with their school building management responsibilities. School leader preparatory programs could also use the School Facility IQ Inventory (SFIQI) as an instructional tool to let potential school leaders be aware of what their school building management responsibilities are.

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Appendix 1: School Facility I.Q. Inventory

This is an inventory of principals' school facility I.Q. Your professionalism and honesty in completing this inventory are highly appreciated.

A. School Facility Concepts. (Please check "true" or "false.")

TRUE	FALSE	
_____	_____	1. Educational literature shows that there is a positive relationship between school physical environment and student attitude, achievement, and behavior.
_____	_____	2. A school building is designed to support community programs.
_____	_____	3. Construction materials determine how schools are designed.
_____	_____	4. Effective maintenance prolongs the life of a school building.

B. School Facility Facts: (Please check "yes" or "no.")

Do you know……

YES	NO	
_____	_____	5. Your school's year of original construction and renovation (if applicable)?
_____	_____	6. The total square footage of your school building?
_____	_____	7. The total acreage of your school site?
_____	_____	8. The total number of classrooms by type (i.e., general classrooms, science labs, resource rooms, computer labs, etc.)?
_____	_____	9. The locations of all the utility main valves?
_____	_____	10. The capacity of your school building?
_____	_____	11. The special design features of each instructional area?
_____	_____	12. The technology capabilities of your school?
_____	_____	13. The color schedule of paint in your school (brand, tone, etc.)?
_____	_____	14. The fire zones of your school?
_____	_____	15. The system of keying doors in your school?
_____	_____	16. The heating and air-conditioning zones in your school?
_____	_____	17. The handicapped accessibility designs for your school?
_____	_____	18. The location of the closest fire hydrant to your school?
_____	_____	19. If your school has surveillance cameras?
_____	_____	20. If your school has a sprinkler system?
_____	_____	21. If your school has fire escape windows?
_____	_____	22. If your school has security lights?
_____	_____	23. If your school has an inventory of facilities and equipment?
_____	_____	24. If your school has a floor plan and a site plan readily available?
_____	_____	25. If sidewalks are available for walkers to come to your school?

C. School Facility Maintenance. (Please check "yes" or "no.")

Do you know……

YES	NO	
_____	_____	26. Who mows the lawn for your school?
_____	_____	27. Who cleans the classrooms in your school?
_____	_____	28. Who changes the light bulbs in your school?
_____	_____	29. Who takes care of landscaping at your school?
_____	_____	30. What determines the number of custodians in your school?
_____	_____	31. What your custodian can fix and what maintenance should fix?
_____	_____	32. How often the carpet is shampooed in your school?
_____	_____	33. How often the floor tiles are buffed and waxed in your school?
_____	_____	34. How often are heating and air-conditioning filters changed in your school?
_____	_____	35. How often the lawns are irrigated at your school?
_____	_____	36. How often light fixtures are cleaned?
_____	_____	37. How much and what kind of custodial supplies are needed for your school?
_____	_____	38. How to maintain the good appearance of your school building?
_____	_____	39. That the urgency of critical maintenance items needs to be stressed?
_____	_____	40. If community volunteers can help with school maintenance?
_____	_____	41. If outsourcing maintenance is a school decision?
_____	_____	42. If a record of school maintenance is available?
_____	_____	43. When is your school scheduled for re-roofing?
_____	_____	44. When is your school scheduled for repainting?
_____	_____	45. When is your school scheduled for carpet replacement?

D. School Facility Operation. (Please check "yes" or "no.")

Do you know……

YES	NO	
_____	_____	46. How often the grease trap in your school is cleaned?
_____	_____	47. How often fire extinguishers and exit light batteries are checked?
_____	_____	48. How often the playground equipment is checked?
_____	_____	49. How often the dumpster is emptied for your school?
_____	_____	50. How often air quality is tested in your school?
_____	_____	51. How often mold and radon is checked in your school?
_____	_____	52. How often water quality is tested in your school?
_____	_____	53. How often your school is sprayed for extermination?
_____	_____	54. How often you need to practice fire drills in your school?
_____	_____	55. How the fire doors in the hallways work?
_____	_____	56. How the security alarm system works in your school?
_____	_____	57. How the emergency power generator works in your school?
_____	_____	58. How the smoke detectors and the heat detectors work in your school?
_____	_____	59. How the intercom system works in your school?

_____ _____ 60. How the telecommunication system works in your school?
_____ _____ 61. How the fire alarm system works in your school?
_____ _____ 62. How safe and healthy environments are maintained in portable classrooms?
_____ _____ 63. That chaining the exit doors is a fire code violation?
_____ _____ 64. That only licensed plumbers are permitted to service the boiler?
_____ _____ 65. If emergency plans are developed in your school?
_____ _____ 66. If your school participates in the district-wide energy management plan?
_____ _____ 67. If the doors in your school are fire-rated?
_____ _____ 68. If the traffic flow on your campus is safe and efficient?
_____ _____ 69. The good and poor qualities of your school building?
_____ _____ 70. The normal boiler temperature of your school?
_____ _____ 71. The energy conservation plan of your school?

E. Principal's Demographics: (Please check one of the spaces in the following:)

Age: ____ Under 30 ____ 30-40 ____ 40-50 ____ 50-60 ____ Over 60

Gender: ____ Male ____ Female

Years as Principal: ____ 1- 5 ____ 6-10 ____ 11-15 ____ 16-20 ____ Over 20

Education: ____ M.Ed. ____ Ed.S. ____ Ed.D./Ph.D.

END OF SCHOOL FACILITY I.Q. INVENTORY

Your School Facility I.Q. is _____

Appendix 2: Principals' School Facility I.Q. Inventory

Analytical Themes

Building Demographics:	Items 5, 6, 7, 8, 9, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, and 69
Educational Orientation:	Items 1, 2, 3, 11, 12 and 60
Policies:	Items 4, 17, 23, 24, 30, 31, 37, 40, 41, and 66
Procedures:	Items 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 66, and 71
Security:	Items 15, 19, 22, 56, 59 and 65
Safety:	Items 9, 14, 15, 17, 18, 20, 21, 22, 25, 47, 48, 54, 55, 56, 57, 58, 61, 62, 63, 64, 65, 67, 68, and 70
Healthfulness:	Items 16, 27, 32, 33, 46, 49, 50, 51, 52, 53, 62, and 69
Aesthetics:	Items 13, 26, 29, 32, 33, 35, 36 and 38

Appendix 3: Scoring Sheet

No.	Rubric	Answer	Score	No.	Rubric	Answer	Score
1	T = 1; F = 0			37	Y = 1; N = 0		
2	T = 0; F = 1			38	Y = 1; N = 0		
3	T = 0; F = 1			39	Y = 1; N = 0		
4	T = 1; F = 0			40	Y = 1; N = 0		
5	Y = 1; N = 0			41	Y = 1; N = 0		
6	Y = 1; N = 0			42	Y = 1; N = 0		
7	Y = 1; N = 0			43	Y = 1; N = 0		
8	Y = 1; N = 0			44	Y = 1; N = 0		
9	Y = 1; N = 0			45	Y = 1; N = 0		
10	Y = 1; N = 0			46	Y = 1; N = 0		
11	Y = 1; N = 0			47	Y = 1; N = 0		
12	Y = 1; N = 0			48	Y = 1; N = 0		
13	Y = 1; N = 0			49	Y = 1; N = 0		
14	Y = 1; N = 0			50	Y = 1; N = 0		
15	Y = 1; N = 0			51	Y = 1; N = 0		
16	Y = 1; N = 0			52	Y = 1; N = 0		
17	Y = 1; N = 0			53	Y = 1; N = 0		
18	Y = 1; N = 0			54	Y = 1; N = 0		
19	Y = 1; N = 0			55	Y = 1; N = 0		
20	Y = 1; N = 0			56	Y = 1; N = 0		
21	Y = 1; N = 0			57	Y = 1; N = 0		
22	Y = 1; N = 0			58	Y = 1; N = 0		
23	Y = 1; N = 0			59	Y = 1; N = 0		
24	Y = 1; N = 0			60	Y = 1; N = 0		
25	Y = 1; N = 0			61	Y = 1; N = 0		
26	Y = 1; N = 0			62	Y = 1; N = 0		
27	Y = 1; N = 0			63	Y = 1; N = 0		
28	Y = 1; N = 0			64	Y = 1; N = 0		
29	Y = 1; N = 0			65	Y = 1; N = 0		
30	Y = 1; N = 0			66	Y = 1; N = 0		
31	Y = 1; N = 0			67	Y = 1; N = 0		
32	Y = 1; N = 0			68	Y = 1; N = 0		
33	Y = 1; N = 0			69	Y = 1; N = 0		
34	Y = 1; N = 0			70	Y = 1; N = 0		
35	Y = 1; N = 0			71	Y = 1; N = 0		
36	Y = 1; N = 0						

Total I.Q. Score = **Percentage I.Q. Score =**

Appendix 4: School Facility Areas Scoring Sheet

Area & Item	Rubric	Answer	Score	Area & Item	Rubric	Answer	Score
Demographics			Total =	Ed. Orient.			Total =
5	Y = 1; N = 0			1	T = 1; F = 0		
6	Y = 1; N = 0			2	T = 0; F = 1		
7	Y = 1; N = 0			3	T = 0; F = 1		
8	Y = 1; N = 0			11	Y = 1; N = 0		
9	Y = 1; N = 0			12	Y = 1; N = 0		
10	Y = 1; N = 0			60	Y = 1; N = 0		
13	Y = 1; N = 0			Security			Total =
14	Y = 1; N = 0			15	Y = 1; N = 0		
16	Y = 1; N = 0			19	Y = 1; N = 0		
17	Y = 1; N = 0			22	Y = 1; N = 0		
18	Y = 1; N = 0			56	Y = 1; N = 0		
19	Y = 1; N = 0			59	Y = 1; N = 0		
20	Y = 1; N = 0			65	Y = 1; N = 0		
21	Y = 1; N = 0			Safety			Total =
22	Y = 1; N = 0			9	Y = 1; N = 0		
24	Y = 1; N = 0			14	Y = 1; N = 0		
69	Y = 1; N = 0			15	Y = 1; N = 0		
Policies			Total =	17	Y = 1; N = 0		
4	T = 1; F = 0			18	Y = 1; N = 0		
17	Y = 1; N = 0			20	Y = 1; N = 0		
23	Y = 1; N = 0			21	Y = 1; N = 0		
24	Y = 1; N = 0			22	Y = 1; N = 0		
30	Y = 1; N = 0			25	Y = 1; N = 0		
31	Y = 1; N = 0			47	Y = 1; N = 0		
37	Y = 1; N = 0			48	Y = 1; N = 0		
40	Y = 1; N = 0			54	Y = 1; N = 0		
41	Y = 1; N = 0			55	Y = 1; N = 0		
66	Y = 1; N = 0			56	Y = 1; N = 0		
Procedures			Total =	57	Y = 1; N = 0		
26	Y = 1; N = 0			58	Y = 1; N = 0		
27	Y = 1; N = 0			61	Y = 1; N = 0		
28	Y = 1; N = 0			62	Y = 1; N = 0		
29	Y = 1; N = 0			63	Y = 1; N = 0		
32	Y = 1; N = 0			64	Y = 1; N = 0		
33	Y = 1; N = 0			65	Y = 1; N = 0		
34	Y = 1; N = 0			67	Y = 1; N = 0		
35	Y = 1; N = 0			68	Y = 1; N = 0		
36	Y = 1; N = 0			70	Y = 1; N = 0		

37	Y = 1; N = 0			Heathfulness			Total =
39	Y = 1; N = 0			16	Y = 1; N = 0		
42	Y = 1; N = 0			27	Y = 1; N = 0		
43	Y = 1; N = 0			32	Y = 1; N = 0		
44	Y = 1; N = 0			33	Y = 1; N = 0		
45	Y = 1; N = 0			46	Y = 1; N = 0		
46	Y = 1; N = 0			49	Y = 1; N = 0		
47	Y = 1; N = 0			50	Y = 1; N = 0		
48	Y = 1; N = 0			51	Y = 1; N = 0		
49	Y = 1; N = 0			52	Y = 1; N = 0		
50	Y = 1; N = 0			53	Y = 1; N = 0		
51	Y = 1; N = 0			62	Y = 1; N = 0		
52	Y = 1; N = 0			69	Y = 1; N = 0		
53	Y = 1; N = 0			Aesthetics			Total =
54	Y = 1; N = 0			13	Y = 1; N = 0		
66	Y = 1; N = 0			26	Y = 1; N = 0		
71	Y = 1; N = 0			29	Y = 1; N = 0		
				32	Y = 1; N = 0		
				33	Y = 1; N = 0		
				35	Y = 1; N = 0		
				36	Y = 1; N = 0		
				38	Y = 1; N = 0		

Appendix 5: School Facility IQ Level

Total Scores	Percentiles	School Facility IQ Levels
1 – 17.75	1 - 25%	Not meeting low level requirements
17.75 – 35.50	25 – 50%	Low Level
35.50 - 53.25	50 – 75%	Average Level
53.25 – 71.00	75 –100%	High Level

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