Needs Assessment in Implementation of Fink's Taxonomy Through Functionality of the Quadruple Helix Model

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Abstract
The primary focus of education is to generate a meaningful learning experience that can bring about lasting changes in the learners. Research and innovation that generate new knowledge require needs assessment as evidence for these discoveries. This paper aims to elucidate the role of needs assessment based on the Quadruple Helix Model in the context of implementing the Fink Taxonomy. The emphasis is placed on the four main pillars, namely government, industry, community, and academic institutions. The synergy between the four pillars of the Quadruple Helix Model and the six dimensions of the Fink Taxonomy creates an effective framework for shaping needs assessment for transformative learning. Needs assessment is a process to identify the gap between the current state and the desired state to determine requirements. This assessment aims to identify gaps, prioritize resources, make evidence-based decisions, and foster continuous improvement. The role of the four stakeholders is crucial in framing needs as a strong foundation in the educational context. The limitations of implementing the Fink Taxonomy needs assessment include reaching consensus and power imbalances among the four stakeholders in the Quadruple Helix Model. Understanding the implications of the Quadruple Helix Model and the role of needs assessment in implementing the Fink Taxonomy fosters cooperation among government, industry, academic experts, and the community, promoting innovation, and ensuring sustainability in student learning outcomes. Further research suggestions could include concept development through exploring innovative methodologies and developing new approaches to needs assessment, such as exploring advanced data analysis and artificial intelligence, integrating stakeholder perspectives in needs assessment planning from different sectors, and integrating technology into the implementation of the Fink Taxonomy by exploring effective digital tools or platforms to create interactive and engaging learning experiences in line with Fink's taxonomy principles.
Keywords: Needs Assessment, Quadruple Helix Model, Fink's Taxonomy, Government, Industry, Academia, Community

Introduction

Exploring the dynamic world of education and innovation, the primary focus is on creating a meaningful learning experience that has a lasting impact. Fink's Taxonomy is an interesting framework that goes beyond traditional approaches by emphasizing deep understanding, critical thinking, real-world application, and fostering sustained interest in a subject (Krueger et al., 2011). In the field of research, there is a critical intersection between knowledge and the initiation of discoveries, namely needs assessment. As researchers, we find ourselves at the edge of understanding, armed with curiosity, intellect, and a burning desire to explore something new. Needs assessment functions as a compass that guides us through this vast research landscape, enabling us to identify gaps, define objectives, and lay the foundation for thorough and effective research.

However, to shape needs assessment and realize such transformative learning experiences requires a strong and solid foundation. The Quadruple Helix Model, an innovative and collaborative model, can be utilized in shaping needs assessment in line with the Fink's Taxonomy approach, fostering meaningful learning experiences. The synergy among academia, industry, government, and society, the four pillars of the Quadruple Helix Model (Schütz et al., 2019), introduces a holistic perspective that enriches the process of identifying, understanding, and addressing learning needs in the rapidly evolving knowledge landscape.

The four pillars of the Quadruple Helix Model – academia, industry, government, and society – focus on expertise, resources, and unique perspectives within the education ecosystem. The synergy between the Quadruple Helix Model and Fink's Taxonomy is also explored by demonstrating how basic knowledge, application, integration, human dimensions, caring, and learning how to learn align with the strengths and goals of academic institutions, industry, government, and society stakeholders. The study of this intersection between Fink's Taxonomy, the Quadruple Helix Model and needs assessment is crucial for several reasons. The first reason is enhancing learning experiences. By understanding how these frameworks align, educational institutions can enhance learning experiences, ensuring that students not only acquire knowledge but also develop critical skills applicable to real-world scenarios. Second reason is to address evolving educational landscape. With the rapid evolution of knowledge and technology, a comprehensive study in this area is necessary to adapt educational strategies to meet current and future demands, keeping them relevant and effective. Besides that, the important and need for the study is to optimize research initiatives. Researchers will benefit from a structured needs assessment process, enabling them to identify research gap, define clear objectives, and contribute meaningfully to the advancement of knowledge. The forth reason is to foster collaboration and innovation. The collaboration among government, industry, academia and society, as facilitated by the Quadruple Helix Model, ensures a well-rounded and innovative approach to education, meeting the needs of various stakeholders.

Furthermore, these interactions serve as a framework for developing a needs assessment that focuses on the importance of conducting needs assessment, explaining the elements that lead to the success of needs assessment, the phases and processes involved in needs assessment, best practices in needs assessment, and finally, the strengths and weaknesses of needs assessment techniques.

Quadruple Helix Model

The Quadruple Helix Model is a form of collaboration based on the Triple Helix concept in research methodology. The Triple Helix, introduced by Etzkowitz and Leydesdorff (2000), focuses on the synergy between academia, government, and industry in generating new innovations. The Triple Helix concept gained attention, evolved, and led to increased collaboration among stakeholders to enhance efficiency and produce new innovations that impact stakeholders. Therefore, Carayannis and Campbell (2009) proposed the addition of the community to the Quadruple Helix Model, emphasizing research towards innovation and creativity to meet social needs (Leydesdorff, 2012).

The Quadruple Helix Model represents a collaborative framework involving four key stakeholders: government, industry, academic institutions, and the community. The integrated collaboration among these four elements in the Quadruple Helix Model results in high-impact partnerships that enhance the quality of education, graduate employability, and the financial sustainability of academic institutions (Ministry of Higher Education, 2020). Each stakeholder brings expertise, resources, and different perspectives to the field of education, enriching the learning experience and contributing to holistic development.

Government

a. Expertise: Government agencies shape education policies, regulations, and standards. Government bodies have expertise in formulating education policies, allocating funding, and understanding societal needs. Government officials are attuned to the educational needs at both local and national levels.

b. Resources: The government allocates funds for education, research, and infrastructure development. It also provides data and research insights related to curriculum decisions and support initiatives aimed at enhancing the quality and accessibility of education.

c. Perspective: The government's perspective focuses on societal needs, equity, and governance. It ensures that education aligns with broader societal goals, addresses skills gaps, and supports economic development while promoting equal access to education.

Industry

a. Expertise: The industry encompasses business, companies, and the job market, providing expertise in the practical application of knowledge, industry trends, and skill requirements for specific professions. Industry professionals have insights and expertise in real-world challenges and new technologies.

b. Resources: Industries offer financial support, practical training, programs, and access to the latest technology. These resources facilitate skill development, exposure to current industry practices, and hands-on learning.

c. Perspective: The industry perspective emphasizes employability, practical skills, and relevance to career markets. It contributes to bridging the gap between academia and real-world applications, ensuring graduates are equipped for successful entry into the workforce.

Community

Expertise: The community represents collective wisdom, cultural diversity, and social needs. Collective wisdom refers to the idea that large groups collectively make wiser decisions, problem-solving, innovation implementation, and predictions (Hamada, Masataka & Jun, 2020; Landemore, 2012). The community also contributes axpertise in experiential knowledge, historical context, and perspectives on real-world challenges faced by individuals.

a. Resources: The community provides platforms for community engagement, guidance, and social integration. In the educational context, the community includes educators, researchers, and students who can use their skills and knowledge to address local and global issues.

b. Perspective: The community's perspective emphasizes civic responsibility, ethical considerations, and community involvement that foster values, empathy, and ensure education contributes to overall societal improvement.

Academia

a. Expertise: Academia, encompassing educational institutions such as universities and research centres, hold expertise in curriculum development, pedagogical methods, and research. Educators and researchers possess knowledge of effective teaching strategies, learning theories, subject expertise, and research.

b. Resources: Academic institutions provide various resources such as libraries, research facilities, laboratories, and a pool of skilled educators and experts. These resources enable the creation of meaningful and innovative learning experiences.

c. Perspective: Academia places significant emphasis on theoretical foundations and critical thinking. The unique perspective of academia focuses on fostering intellectual inquiry, research skills, and fundamental knowledge crucial to comprehensive education.

Synergy of Fink's Taxonomy and the Quadruple Helix Model

The synergy between Fink's Taxonomy and the Quadruple Helix Model creates a framework capable of shaping needs assessment for the development of holistic and responsive education to real-world needs. The six dimensions of Fink's Taxonomy – foundational knowledge, application, integration, human dimension, caring, and learning how to learn – align with the strengths and goals of stakeholders in each core of the Quadruple Helix Model, namely government, industry, community, and academic institutions.

Foundational Knowledge

a. Government: The government supports academic institutions in maintaining high-quality education standards to ensure students have a solid foundational knowledge in line with the nation's educational aspirations and goals.

b. Industry: Industries value workers with a strong foundational knowledge, particularly in the workforce. Additionally, industries can collaborate with academic experts to provide input on essential knowledge and skills required in specific careers.

c. Community: Informed communities benefit from individuals with a strong foundational knowledge who can make informed decisions and actively participate in civic activities.

d. Academia: Academic institutions excel in delivering foundational knowledge through structured curricula developed by educators and research experts. These institutions also ensure students gain a robust understanding of basic concepts.

Application

a. Government: The government can fund in initiatives that encourage hands-on learning experiences and foster an education system that prepares students for practical challenges.

b. Industry: Industries can offer practical training, programs, and collaborative projects that allow students to apply concepts and theories to real-world situations (Anjum, 2020).

c. Community: Practical application benefits the community by producing graduates who can contribute to innovation and problem-solving in their careers.

d. Academia: Academic institutions can design curricula that encourage practical application of knowledge through projects, case studies, and simulations.

Integration

a. Government: The government can create partnerships that encourage collaboration between institutions in different fields of expertise and promote an integrated approach to education and research.

b. Industry: Industries can provide insights into interdisciplinary challenges faced in the workplace, inspiring educators to integrate relevant topics into the curriculum.

c. Community: Integration enhances the ability to address complex community challenges that require solutions from various facets (Smith et al., 2022).

d. Academia: Curricula can be designed to integrate knowledge from various disciplines, foster interdisciplinary thinking, and master various problem-solving skills.

Human Dimension

a. Government: The government incorporates ethical and societal dimensions into education policies.

b. Industry: Industries encourage corporate social responsibility (Mohd Ashmir Wong et al., 2022; Nzuva, 2022) and ethical practices, urging students to consider societal impacts in their careers.

c. Community: Focus on the human dimension in the community through the production of graduates with empathy and dedication to positively contribute to society.

d. Academia: Academic institutions emphasize the importance of ethical considerations and social responsibility in students through coursework, discussions, active engagement, and producing graduates who prioritize community well-being.

Caring

a. Government: The government can promote policies prioritizing the well-being of citizens, ensuring access to quality education, healthcare, and social services.

b. Industry: Industries encourage corporate social responsibility (Mohd Ashmir Wong et al., 2022; Nzuva, 2022) and ethical practices, urging students to consider societal impacts in their careers.

c. Community: Focus on the human dimension in the community through the production of graduates with empathy and dedication to positively contribute to society.

d. Academia: Academic institutions emphasize the importance of ethical considerations and social responsibility in students through coursework, discussions, active engagement, and producing graduates who prioritize community well-being.

Learning how to Learn

a. Government: The government can invest in educational initiatives that equip students with adaptable skills and enhance their ability to learn throughout their lives.

b. Industry: Industries provide continuous learning opportunities, encouraging employees to embrace lifelong learning and adapt to changing job demands (Park et al., 2020).

c. Community: Learning how to learn empowers communities to progress in a rapidly evolving world and fosters resilience in mental growth.

d. Academia: Academic institutions focus on developing students' metacognitive skills, teaching effective learning methods, and adapting to new challenges.

Understanding Needs Assessment

Roger Kaufman, hailed as the "father of needs assessment," is recognized for pioneering the development of a model that defines needs as the gap between current outcomes and desired outcomes (Dean & Ripley, 2016). Before defining needs assessment, it is crucial to understand what needs are. Needs are discrepancies or gaps between 'what exists in the current state' and 'what should exist in the desired state' (Bazerman & Moore, 2013). Therefore, needs assessment or a needs study is a systematic process to gather, analyze, and interpret information to identify the gaps between the current state and the desired state to determine the specific needs and priorities of individuals, groups, organizations, or communities (Benge, Harder & Warner, 2019).

Purpose of Needs Assessment

Effective needs assessment helps researchers identify, understand, and prioritize the needs that require attention. Furthermore, researchers can comprehend contributing factors and choose evidence-based strategies for addressing identified needs, develop and implement selected strategies, assess whether these strategies are suitable for addressing improvement needs, and achieve desired outcomes (Cuiccio & Husby-Slater, 2018). In the context of higher education, needs assessment is considered crucial for several reasons, including:

a. Identifying gaps and prioritizing resources
Needs assessment helps researchers identify gaps and efficiently prioritize and allocate limited resources, focusing on addressing the most urgent needs.

b. Making evidence-based decisions:

Needs assessment provides a systematic approach to gather data and evidence about the current state and future needs, serving as the foundation for evidence-based decisions. This enables researchers to make informed choices regarding resource allocation, research priorities, and strategic planning.

c. Fostering continuous improvement:

Conducting needs assessment allows researchers to monitor changes in needs and adjust the focus of research accordingly. Needs assessment also encourages a culture of continuous assessment and improvement.

Elements of Needs Assessment Success

Success in needs assessment can be achieved through the active and meaningful engagement of all stakeholders in the process of examining, identifying, and diagnosing challenges that need to be addressed for improvements to occur. The diagram below illustrates a framework outlining key considerations for the success of needs assessment.

Figure 1: A successful needs assessment framework

a. Needs-driven and context-specific approach:

Successful needs assessment is needs-driven and context-specific. The design and scope of needs assessment regarding the issues, topics, and questions to be addressed are built on the impetus of needs. Meanwhile, the context specificity describes the design and input of data in the local context.

b. Rigorous data analysis:

Success in needs assessment can be achieved through rigorous data analysis, utilizing diverse datasets, including qualitative or quantitative data, and high-quality data that have undergone data collection procedures with high validity and reliability.

c. Collaborative identification of improvements:
Successful needs assessment occurs when researchers can collaboratively identify improvements with stakeholders and encourage mutually beneficial cooperation for all parties.

d. Stakeholder engagement:
Success in needs assessment can be achieved by involving local stakeholders, ensuring that planning, data collection, consideration of root causes, and needs identification are recognized by stakeholders.

Needs Assessment Phases
Needs assessment involves three main phases: pre-assessment, assessment, and post-assessment (Loweth et al., 2020.

a. Pre-assessment Phase:
In the pre-assessment phase, a diverse team is assembled to clarify the goals of the needs assessment, conduct contextual research, and identify key stakeholders. During this pre-assessment phase, data collection tools such as interview protocols and observation frameworks are developed. Potential screening criteria for future needs screening are also identified at the end of the pre-assessment phase.
b. Assessment Phase:
The assessment phase proceeds with the selection of research methods, whether quantitative or qualitative. Subsequently, in the data collection phase, preliminary analysis is also conducted to validate the quality of the collected data and identify initial needs that prompt a reiteration of the data collection approach. The assessment phase concludes when rigorous and thorough quantitative or qualitative analysis has been performed on the complete dataset.
c. Post-assessment Phase:
The final phase is the post-assessment phase. In this phase, the researcher refines the definition of the identified needs through comprehensive analysis to ensure that the needs assessment yields outcomes as expected by stakeholders. The researcher then screens the needs based on definitive screening criteria to identify appropriate needs and provides a summary report of the findings.

Types of Scoring Rubrics
Several needs assessment best practices have been proposed across disciplines. Among them are;

Table 1
Needs assessment best practices identified from the need's assessment literature (Loweth et al., 2020)

	Best practices	Definition
1.	Identify how one's own subjectivity influences the process	Identify how the team's collective expertise and prior experience can influence the team's perspective on the needs and approach to conducting the needs assessment.
2.	Collect different types of data	Collect and compare conclusions across different types of data, such as interviews, observations, surveys and focus groups.
3.	Choose a data collection method based on specific criteria	Choose a data collection method that best fits the goals of the needs assessment and is appropriate for the stakeholders.
4.	Interact with various stakeholders	Obtain input from various different interest groups in the community or organization.
5.	Develop rigorous metrics to assess and prioritize requirements	Develop consistent benchmarks to assess the reliability and relevance of identified needs and determine which needs to be addressed first.
6.	Engage communities or organizations as equal partners	Engage community or partner organizations as equal participants in the needs assessment process to build partner capacity and support partners in addressing identified needs.

Needs Assessment Process
In general, the needs assessment planning process involves the following steps (Smart, 2019):

Step 1: Define the Scope of Needs Assessment
In the first step, the researcher needs to clarify the purpose, determine the approach used, and identify decision-makers involved in the need's assessment. The scope of needs assessment can vary, and it is crucial to limit the scope of needs assessment to matters that can be reasonably addressed. Ultimately, needs assessment can be a resource investment depending on available resources.

Step 2: Determine Assessment Criteria
In this step, the researcher builds a clear set of criteria to enable a systematic, effective, and prioritized assessment of diverse needs. The assessment criteria will determine priorities to

be addressed first. Needs assessment is likely to identify various issues, methods, and conflicts in determining priorities that need to be addressed. The established criteria should be agreed upon before data collection is conducted. The researcher also needs to plan the determination of these criteria to ensure that the process is carried out meticulously. It is important to note that not all criteria will be used in needs assessment. Therefore, the researcher needs to be proficient in selecting and agreeing on relevant criteria.

Step 3: Plan for Data Collection
In this step, the researcher identifies the required data, whether quantitative, qualitative, or a mix. Quantitative data focuses more on numbers and calculations, while qualitative data emphasizes the perspectives and experiences of study participants. Methods commonly used in quantitative research include surveys, while qualitative research involves observation, focus groups, and interviews. Finally, the choice of data collection method depends on the scale and approach of needs assessment and the amount of data collected.

Step 4: Collect, Analyze, and Present Data
After the researcher has a plan, data collection, and analysis can be carried out. The researcher needs to be flexible with findings during data collection. Once data is collected, the researcher will have a dataset and will present it.

Step 5: Use Criteria and Prioritize Needs
A set of needs identified through data collection and analysis is presented to decision-makers. In this step, these needs will be assessed and usually use various strategies in decision-making. Strategies suggested by Witkin and Altschuld (1995) include ranking and positioning strategies by assessing each identified need as high, moderate, or low, prioritizing needs in the highest position.

Step 6: Identify Next Steps and Report Back
In the final step, the researcher identifies the next steps to gain a deeper understanding and considers effective approaches or interventions. Finally, it is a good practice to report back the results of the needs assessment to stakeholders

Advantages and Disadvantages of Needs Assessment Techniques

Table 2

Advantages and disadvantages of needs assessment techniques (McCawley, 2009)

	Technique	Advantages	Weaknesses
1.	Questionnaires	• Cheap • Questionnaires are usually easy to prepare • Able to collect data from a large number of samples • Data is easy to summarize	• Time consuming • Potentially low rate of return • Information from the study may be biased or inaccurate • Lack of detail • The information given is only related to the question asked
2.	Observation	• Generate data that is relevant to the work environment • Reduces distractions in the workplace	• Requires a skilled observer • Affects the behavior of the observed sample
3.	Interviews	• Useful to gain insight and context in a topic in depth • Allow respondents to explain what is important to them • Useful when it is difficult to gather people in a group Suitable for use in discussions involving some topics that are too personal to be discussed in a focus group	• Sometimes it's hard to find a diversity of opinions and perspectives • May take longer in implementation • Requires a skilled interviewer
4.	Focus groups	• Easy to implement • Results can be obtained in a short period of time • Social interaction in groups produces more independent and complex responses • Responses have high face validity due to the explanation of the context and details of the discussion	• Requires a highly skilled moderator • Group members are difficult to gather • Individual responses differ from other individuals • The group is self-selected, the results may not represent the population

In the Malaysian context, the best practices for needs assessment in the effective implementation of Fink's Taxonomy, particularly in the Science subject, can be achieved by gaining a profound understanding of the six dimensions of Fink's Taxonomy. The comprehension of Fink's Taxonomy can be evaluated by conducting preliminary studies on

teachers, students, or other stakeholders, seeking feedback regarding the strengths, weaknesses, and areas for improvement in Science education.

Furthermore, stakeholder involvement, such as teachers, students, parents, and policymakers in Science education, is prioritized in the best practices of needs assessment. Priority is given to stakeholders by obtaining feedback on the current situation of Science education in Malaysia, identifying challenges to be addressed, and expectations to be achieved based on the primary needs identified.

Moreover, the best practices of needs assessment can also be carried out by aligning the implementation of Fink's Taxonomy with the national curriculum standards for the Science subject in Malaysia. Alignment can be achieved by identifying synergies and adjustments needed to effectively integrate Fink's Taxonomy into Science education. The synergy and adjustments are assessed by looking at the readiness of Science teachers to implement Fink's Taxonomy in their teaching practices.

Lastly, the best practices for assessing the needs of implementing Fink's Taxonomy in the Science subject must consider the unique cultural and contextual factors in Malaysia. Fink's Taxonomy is adapted to meet the local educational context, including language, cultural norms, and community expectations, providing opportunities for professional development and support from the education system in Malaysia.

Role of the Quadruple Helix Model

The main objective of this conceptual paper is to elucidate the roles of the four stakeholders in the Quadruple Helix Model – government, industry, community, and academic institutions – in the implementation of Fink's Taxonomy through effective needs assessment. Figure 1 illustrates the relationship between the Quadruple Helix Model, Needs Assessment, and Fink's Taxonomy. This relationship explains that the Quadruple Helix Model emphasizes the importance of collaboration and shared responsibility among the four stakeholders, while needs assessment helps identify specific educational needs and align them with the expectations of the government, industry, and community. Furthermore, Fink's Taxonomy provides a structured approach to shaping learning experiences that can address the identified needs and integrate various dimensions for holistic and meaningful education.
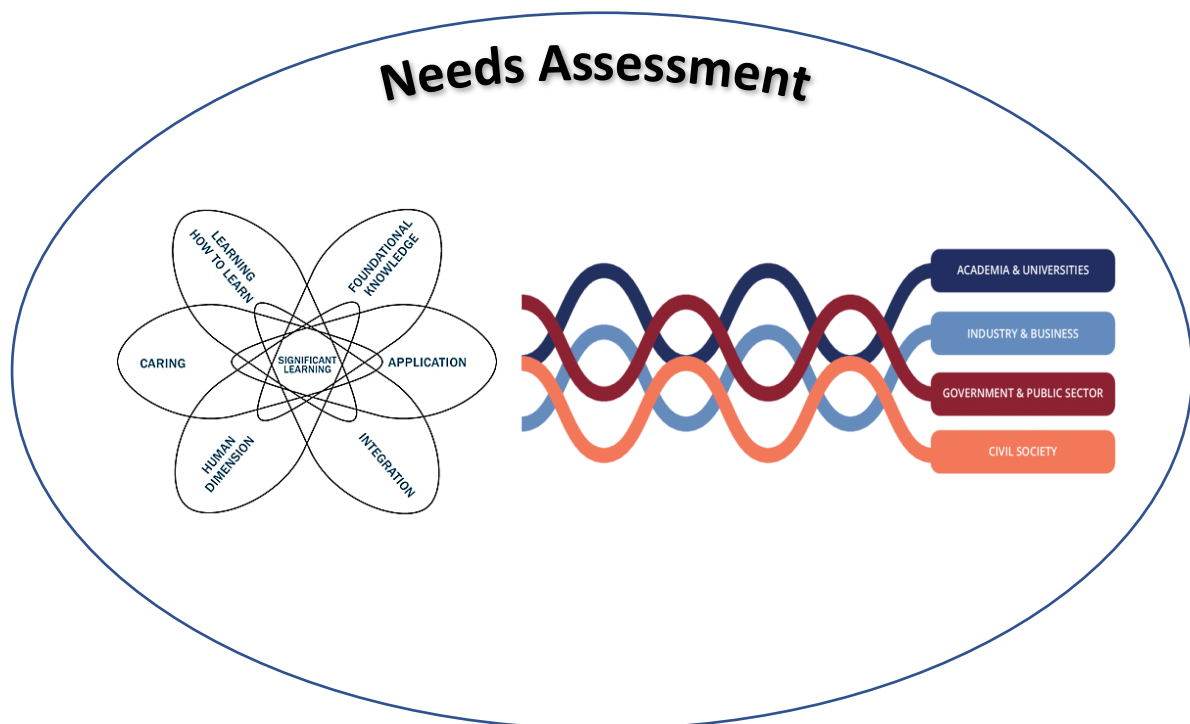
Figure 2: The relationship between the Quadruple Helix Model, Needs Assessment and Fink's Taxonomy

Government

The government plays a role in various aspects contributing to the effective implementation of needs assessment aligned with Fink's Taxonomy, aiming to foster transformative learning experiences.

a. Framework and Policy Guidelines:

Government bodies are responsible for establishing policies, regulations, and guidelines shaping the educational landscape. In the context of needs assessment, the government provides a comprehensive framework guiding the alignment of educational objectives with Fink's Taxonomy. The formulated policies emphasize the importance of holistic learning outcomes and encourage the integration of critical thinking, applying knowledge to the real world.

b. Resource Allocation and Funding:

Government agencies play a crucial role in allocating funding and resources to educational institutions for the implementation of Fink's Taxonomy. The government also allocates resources to support research implementation, curriculum development, pedagogy, technology integration, assessment quality, and professional development for educators contributing to effective needs assessment aligned with Fink's Taxonomy.

Industry

The industry is responsible for bringing expertise, practical insights, and real-world demands, ensuring that needs assessment is relevant, implementable, and responsive to the skills and competencies required by the job market.

a. Practical Alignment and Real-World Relevance:

The industry has a profound understanding of the skills, knowledge, and competencies required in various career fields (Pang et al., 2019). Collaboration with educational institutions, such as the Ministry of Education Malaysia (MOE), enables industry agencies to contribute perspectives and ideas that help align assessment objectives with practical workforce demands, ensuring graduates are prepared for the real-world job market. Teach for Malaysia Foundation (YTFM), in collaboration with MOE, selects outstanding graduates to serve the country by joining the teaching profession (Teach for Malaysia, 2021).

b. Soft Skills and Professionalism:

The industry plays a role in implementing soft skills such as communication, teamwork, and adaptability in assessments. These skills are critical for success in the workplace and align with the humanistic and caring dimensions in Fink's Taxonomy.

c. Technological Advancements and Tools:

The industry is at the forefront of technological advancements. A needs assessment designed by the industry can incorporate technology-related challenges, encouraging students to engage with digital tools, software, and technology platforms (Haleem et al., 2022) relevant to future careers.

Community

The community comprises people with diverse cultural contexts and societal values, playing a crucial role in shaping effective needs assessments aligned with Fink's Taxonomy.

a. Cultural and Contextual Alignment and Diverse Perspectives:

Communities bring diverse cultures, values, contexts, and perspectives. This diversity can frame an inclusive assessment accessible to students from various backgrounds. Needs assessment designed in collaboration with the community reflects cultural perspectives and contextual realities that shape students' learning experiences. Community-involved assessments incorporate cultural elements that can influence educational needs, aspirations, and challenges, ensuring assessment tools and methodologies are relevant and provide a holistic picture of students' learning experiences. A structured assessment also encourages student engagement and contributes to a harmonious community.

b. Ethical Considerations and Social Responsibility:

Communities promote ethical considerations and social responsibility in education (Senin et al., 2019). Needs assessments can be designed by incorporating dimensions related to ethics, sustainability, and societal impact, aligning with the humanistic and caring dimensions in Fink's Taxonomy.

Academia

The role of academic institutions is crucial in leveraging expertise, pedagogical methods, and commitment to holistic education to contribute to the creation of transformative learning experiences.

a. Expertise in Education Pedagogy and Assessment:

Academic institutions have in-depth knowledge of educational theories, pedagogical methods, and assessment strategies that can shape effective needs assessments, focusing not only on knowledge acquisition but also aligning with the cognitive, affective domains, and

Fink's Taxonomy dimensions. Assessments are meaningful and contribute to the development of inquisitive, self-directed, and actively engaged students.

b. Promoting Lifelong Learning:

Academia designs assessments that encourage learning-to-learn skills and metacognition. Students are encouraged to provide self-feedback on their learning processes, adjust strategies, and continue learning beyond formal education. This approach aligns with Fink's Taxonomy's emphasis on fostering self-directed learning.

c. Integration of Multiple Disciplines:

Academic institutions, such as universities, embrace education across multiple disciplines (N, 2022), aligning with the integration dimension in Fink's Taxonomy. Needs assessments can be designed to encourage students to synthesize knowledge and skills from various disciplines, promoting a holistic understanding of complex topics and challenges.

d. Incorporating Active and Experiential Learning:

Academic institutions emphasize active learning and experiential-based methods (Villarroel et al., 2020), aligning with the application dimension in Fink's Taxonomy. Needs assessments can be structured to reflect real-world scenarios, encouraging students to apply their knowledge in practical situations. This approach fosters critical thinking, problem-solving skills, and the ability to transfer knowledge to different contexts.

Significance of the Study

The study of the Quadruple Helix Model, needs assessment and the implementation of Fink's Taxonomy in the field of education hold paramount importance for a diverse range of stakeholders, each deriving unique benefits from a collaborative approach. Emphasizing the significance of this study can be achieved by highlighting its relevance to various groups such as;

a) Government Officials and Policymakers:

Government entities are crucial players in shaping educational policies and strategies (Cheong, Hill & Leong, 2016). Understanding the Quadruple Helix Model and needs assessment helps policymakers create more effective and sustainable educational frameworks that align with the demands of the industry and community. Enhanced collaboration among government, industry, academia, and the community ensures the development of policies that promote innovation, workforce readiness, and economic growth.

b) Industry Leaders and Employers:

Industries are directly impacted by the quality of education and the skills students acquire (Dwiyanti, Ana & Widianingsih, 2018). This study provides insights into tailoring educational programs to meet industry needs, fostering a workforce that is better equipped and aligned with currect and future industry demands. The implementation of Fink's Taxonomy ensures that educational strategies focus on real-world applications and skills, producing graduates who are not only academically proficient but also practically adept, meeting industry expectations.

c) Academic Institutions and Educators:

Educational institutions play a pivotal role in preparing students for the challenges of the modern world (Almaiah, Al-Khasawneh & Althunibat, 2020; Jan, 2017). Integrating the

Quadruple Helix Model and needs assessment with Fink's Taxonomy llows educators to adapt their teaching methods, ensuring relevance, innovation, and sustainability in student learning outcomes. Educators can create more engaging and effective learning experiences, fostering critical thinking, problem-solving, and interdisciplinary skills in students. This, in turn, enhances the reputation and success of academic institutions.

d)   Community Members and Nonprofit Organizations:
The community is a vital stakeholder in the educational process, and its involvement contributes to social cohesion and development (Montero & Leite, 2022). The study helps in tailoring educational programs to address community needs and aspirations. Increased collaboration ensures that education serves community interests, leading to a more informed, skilled, and engaged citizenry. Nonprofit organizations can also benefit by aligning their efforts with educational initiatives that address community-specific challenges.

e)   Students and Future Professionals:
Students are the primary beneficiaries of any educational initiative (Agyei, 2020). This study ensures that their learning experiences are relevant, innovative, and equipped to meet the demands of a dynamic world. Students gain practical skills, critical thinking abilities, and a holistic education that prepares them for successful careers. They become more adaptable, competitive, and contribute meaningfully to society.

Conclusion

In summary, this conceptual paper elucidates the roles of needs assessment based on an understanding of the Quadruple Helix Model in the context of implementing Fink's Taxonomy, with a focus on the four main cores: government, industry, community, and academic institutions. Although the Quadruple Helix Model encourages collaboration among government, industry, academic institutions, and the community, there are limitations in needs assessment for the implementation of Fink's Taxonomy. Due to the involvement of various stakeholders with diverse interests, priorities, and power dynamics, this complexity can pose challenges in reaching a consensus on needs assessment, especially in implementing the Fink's Taxonomy framework. Furthermore, power imbalances among Quadruple Helix stakeholders affect the needs assessment process, where academic institutions are perceived to have less influence compared to the government or industry, potentially resulting in less emphasis on the implementation of Fink's Taxonomy. Additionally, the implementation of Fink's Taxonomy requires a shift in teaching strategies within the education system. However, not all Quadruple Helix stakeholders are capable of changing existing educational structures or practices, and resistance to such changes can hinder effective needs assessment processes and, subsequently, the implementation of Fink's Taxonomy.

Understanding the Quadruple Helix Model and the role of needs assessment in the field of education focusing on the implementation of Fink's Taxonomy has implications for fostering cooperation among government, industry, academic experts, and the community. Collaboration and engagement among stakeholders can be enhanced through effective needs assessment, enabling the identification of specific needs and expectations that can further align educational strategies. The integration of the Quadruple Helix Model with needs assessment also makes the implementation of Fink's Taxonomy part of educational

development strategies, promoting innovation and ensuring sustainability in student learning outcomes.

However, without needs assessment in the implementation of Fink's Taxonomy, adverse effects will be felt by various Quadruple Helix stakeholders, especially academic institutions. Without needs assessment, academic institutions find it challenging to align the implementation of Fink's Taxonomy with the actual needs and challenges of education, resulting in a misalignment between the teaching strategies used by educators and the actual needs of students. This negative impact on academic institutions will have detrimental effects on students' learning experiences and also on the success of government-set educational policies and goals.

Therefore, it is evident that academic institutions are expected to play the most dominant role in needs assessment for the implementation of Fink's Taxonomy. Academic institutions possess expertise in education and a profound understanding of pedagogy, equipped with educators and professionals who specialize in curriculum development, teaching methodologies, and student learning. Academic institutions also have direct and continuous interaction with students to observe, analyze, and understand various learning needs, priorities, and challenges faced by students in an educational context. Furthermore, academic institutions play a role in aligning the taxonomy with existing curricula and ensuring that Fink's Taxonomy is effectively integrated into teachers' practices and meets the specific needs of students.

Among the four stakeholders in the Quadruple Helix Model, the community is expected to play a less dominant role in the needs assessment of implementing Fink's Taxonomy. The community focuses more on various societal issues and lacks the expertise, involvement, and direct interaction in education, including Fink's Taxonomy. The community also has limitations in financial resources and personnel, restricting the ability to actively participate in comprehensive needs assessments compared to entities more directly involved, such as academic institutions.

The needs assessment in Fink's Taxonomy can be developed for future research by exploring the cultural adaptability of Fink's Taxonomy in diverse educational environments and the needs of students from various cultural backgrounds. The long-term effects of implementing Fink's Taxonomy on student learning outcomes are also explored by assessing the development of critical thinking skills, knowledge application, and overall academic achievement to measure the taxonomy's effectiveness in enhancing student learning experiences. Additionally, the effectiveness of professional development programs for educators in implementing Fink's Taxonomy is studied by focusing on the design and impact of training initiatives aimed at improving teachers' understanding and application of the taxonomy in teaching practices. With the advent of Industry 4.0, the integration of technology into the implementation of Fink's Taxonomy is explored by examining effective digital tools or platforms to create interactive and engaging learning experiences aligned with Fink's Taxonomy principles. Finally, continuous improvements in the implementation of Fink's Taxonomy need to be developed by exploring mechanisms for continuous assessment, researching feedback, and adjustments to ensure the implementation remains responsive to evolving educational needs.

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References

Agyei, D. D. (2020). The Impact of Educational Technology Initiatives on Student Learning Outcomes: Perspectives of Sub-Saharan Africa. International Journal of Education, Learning and Development, 8(7), 43-62.

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies, 25*: 5261-5280. https://doi.org/10.1007/s10639-020-10219-y

Amerstorfer, C. M., & Freiin von Münster-Kistner, C. (2021). Student Perceptions of Academic Engagement and Student-Teacher Relationships in Problem-Based Learning. *Frontiers in Psychology, 12*: 1–18. https://doi.org/10.3389/fpsyg.2021.713057

Anjum, S. (2020). Impact of internship programs on professional and personal development of business students: a case study from Pakistan. *Future Business Journal, 6*(1): 1–13. https://doi.org/10.1186/s43093-019-0007-3

Benge, M., Harder, A., & Warner, L. (2019). *Conducting the Needs Assessment #1: Introduction 1*. https://edis.ifas.ufl.edu/publication/WC340

Carayannis, E. G., & Campbell, D. F. J. (2009). "Mode 3" and "Quadruple Helix": toward a 21st century fractal innovation ecosystem. *Int. J. Technology Management, 46*: 201–234.

Cheong, K. C., Hill, C., & Leong, Y. C. (2016). Malaysia's Education Policies and the Law of Unintended Consequences. Journal of International and Comparative Education, 5(2), 73-85.

Cuiccio, C., & Husby-Slater, M. (2018). *Needs Assessment Guidebook: Supporting the Development of District and School Needs Assessments*. State Support Network.

Dean, P. J., & Ripley, D. E. (2016). Chapter 9: Roger Kaufman, PhD: The Needs Assessment Audit. *In Performance Improvement*, *55*(7): 43–46. https://doi.org/10.1002/pfi.21606

Dwiyanti, V., Ana, A., & Widianingsih, I. (2018). Industrial Education Impact on Vocational Student Socal Skills. *Innovation of Vocational Technology Education, 2*: 98-103

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*: 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Hamada, D., Nakayama, M., & Saiki, J. (2020). Wisdom of crowds and collective decision-making in a survival situation with complex information integration. *Cognitive Research: Principles and Implications, 5*(48): 1–15. https://doi.org/10.1186/s41235-020-00248-z

Kamaruzzaman, K. (2021). Aktivisme Sosial dan Pemerkasaan Penglibatan Masyarakat dalam Era Media Baharu. E-*Prosiding Seminar Antarabangsa Islam Dan Sains 2021*, 18–34.

Kementerian Pendidikan Tinggi. (2020). *Pelan Tindakan Keusahawanan Institusi Pendidikan Tinggi 2021-2025: Memartabatkan Keusahawanan Dalam Memperkasakan Negara*.

Krueger, K. P., Russell, M. A., & Bischoff, J. (2011). Instructional Design and Assessment: A Health Policy Course Based on Fink's Taxonomy of Significant Learning. *American Journal Of Pharmaceutical Education, 75*(1): 1–7.

Landemore, H. (2012). Collective Wisdom: Old and New. *In Collective Wisdom: Principles and Mechanisms*. Cambridge University Press. https://doi.org/10.1017/CBO9780511846427.001

Leydesdorff, L. (2012). The Triple Helix, Quadruple Helix, ..., and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy? *Journal of the Knowledge Economy, 3*(1), 25–35. https://doi.org/10.1007/s13132-011-0049-4

Loweth, R. P., Daly, S. R., Liu, J., & Sienko, K. H. (2020). Assessing Needs in a Cross-Cultural Design Project: Student Perspectives and Challenges. *International Journal of Engineering Education, 36*(2): 712–731.

McCawley, P. F. (2009). *Methods for Conducting an Educational Needs Assessment: Guidelines for Cooperative Extension System Professionals*.

Montero, C. S., & Leite, L. O. (2022). Towards Local Community Involvement in Students' Science Learning: Perspective of Students and Teachers. Journal of Teaching and Learning, 16(3), 21-43.

Senin, M. A., Halim, H., & Ramdzan Ali, A. A. E. (2019). Corporate Social Responsibility (CSR) for Education in Malaysia: A Systematic Literature Review. *International Journal of Psychosocial Rehabilitation, 23*(3): 631–637.

Wong, M. A. M. S., Harun, N. H., Moidin, S., & Mamat, N. (2022). Mengadaptasi Tanggungjawab Sosial Korporat dari Sudut Filantropi oleh Hotel Patuh Syariah di Malaysia: Satu Kerangka Konsep. *Journal of Islamic Philanthropy & Social Finance, 4*(1): 1–13.

N, R. (2022). The implication of interdisciplinary approach in education – An exploratory study. *GBS Impact: Journal of Multi-Disciplinary Research, 8(*2): 28–39. https://doi.org/10.58419/gbs.v8i2.822203

Nzuva, S. M. (2022). The Role of Corporate Social Responsibility in Promoting Business Growth and Sustainability in the Hospitality Industry. *Asian Journal of Economics, Business and Accounting, 22(*23): 89–103. https://doi.org/10.9734/ajeba/2022/v22i2330739

Pang, E., Wong, M., Leung, C. H., & Coombes, J. (2019). Competencies for fresh graduates' success at work: Perspectives of employers. *Industry and Higher Education, 33*(1): 55–65. https://doi.org/10.1177/0950422218792333

Park, Y., Lim, D. H., Kim, W., & Kang, H. (2020). Organizational Support and Adaptive Performance: The Revolving Structural Relationships between Job Crafting, Work Engagement, and Adaptive Performance. *Sustainability, 12*(1): 1–14. https://doi.org/10.3390/SU12124872

Schütz, F., Heidingsfelder, M. L., & Schraudner, M. (2019). Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation. *She Ji, 5*(2): 128–146. https://doi.org/10.1016/j.sheji.2019.04.002

Smart, J. (2019). *Needs assessment: Families and Children Expert Panel project resource.* Australian Institute of Family Studies.

Smith, K., Maynard, N., Berry, A., Stephenson, T., Spiteri, T., Corrigan, D., Mansfield, J., Ellerton, P., & Smith, T. (2022). Principles of Problem-Based Learning (PBL) in STEM Education: Using Expert Wisdom and Research to Frame Educational Practice. *Education Sciences, 12*(1): 1–20. https://doi.org/10.3390/educsci12100728

Teach For Malaysia. (2021). *Our Impact: Nine Years of Teach For Malaysia*. Teach For All: A Global Network & Kementerian Pendidikan Malaysia

Villarroel, V., Benavente, M., Chuecas, J. M., & Bruna, D. (2020). Experiential learning in higher education. A student-centered teaching method that improves perceived learning. *Journal of University Teaching & Learning Practice, 17*(5): 1–16.

Witkin, B. R., & Altschuld, J. W. (1995). Pl*anning and conducting Needs Assessments: A Practical Guide.* Sage Publications, Inc.