Influence of Spirituality in the Career and STEM-Based Research Approach of Scientists for Sustainable Development: A Study on the Perspective of Scientists from a Public Research University in Malaysia

Mohd Razip Bajuri 1,*, Suzieleez Syrene Abdul Rahim 1, Edy Hafizan Mohd Shahali 1 and Siti Mistima Maat 2

Faculty of Education, Department of Mathematics and Science Education, University Malaya, Kuala Lumpur 50603, Malaysia; suzieleez@um.edu.my (S.S.A.R.); edyhafizan@um.edu.my (E.H.M.S.)

1 Faculty of Education, Research Center of Teaching and Learning Innovation, Universiti Kebangsaan Malaysia, Bangi 43600, Malaysia; sitimistima@ukm.edu.my

Abstract: This explanatory case study aims to formulate a framework of spiritual influence on Science, Technology, Engineering, and Mathematics (STEM)-based research for sustainable development from the perspective of university scientists. This single-site qualitative study involves seven participants from a Malaysian public research university with a variety of specific research fields. Questions regarding the driving factors of their research strategy for sustainable technology developments were asked. Consequently, the main driving factors on using STEM approaches for sustainable developments are career competency enhancements. This theme can be proven with elements, such as STEM for enhancing the ability to expand a specific field contribution, improving interdisciplinary management, obtaining outsource support, and enhancing innovative capability. Meanwhile, spiritual influence on sustainable development is a part of the philosophy of participants and can be proven through the elements of moral and ethical beliefs with respect to religious values in their scientific career and STEM-based research practice. Therefore, the influence of spirituality is a crucial concept, which can ensure social, emotional, economic, and environmental sustainability development. This framework is built among limited participants. Thus, confirming this framework by using a wide range of samples is encouraged. Moreover, this study generally has implications for sustainable development using STEM-based practice for specific field expertise. The concept aims to provide remarkable contributions to the growth of comprehensive, holistic, and sustainable development and to extend the current literature on STEM research approaches by inculcating spiritual elements.

Keywords: sustainable development; spirituality influence; career competency; STEM-based research

1. Introduction

Sustainable Technology Development (STD) and Science, Technology, Engineering, and Mathematics (STEM)-based research agendas of any country, which acts as a driver for the country to accomplish development policies, are vital for its success. At its most basic level, the STEM approach is either implemented by the learning institution or via collaboration with other bodies, such as private sectors, and they work together to achieve a shared aim or set of research aims [1]. The impact of STEM-based research collaboration involves partnership interest creation, social interaction, and shared climate change research. One common reason for the implementation of STEM collaboration is to endow sustainable research processes with a positive influence on the STEM environment, thereby facilitating the social interactions of STEM practitioners and providing professional support to the research and learning institution management [2]. The sustainable STEM concept principle mainly aims to strengthen the STEM learning environment, providing societal

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and outreach support systems within research and educational operation communities [3]. This principle is essential because STEM for a sustainable concept maintains the operation of STEM-based research [4,5] and facilitates the growth of new technology development without compromising the needs of the future [6].

Meanwhile, Spiritual-Driven Development (SDD) with respect to a STEM-based research concept is important because the current occurrence of new technology disruptions could violate the economic survival of nature, mankind, and the world. The World Economic Forum Organization reported 21 technology tipping points, which promote injustice in social, economic, and world climate issues worldwide [7]. These new technologies from STEM-based research activities can create technology disruptions, such as implantable technologies, wherein people are becoming increasingly connected to devices and their bodies. Devices are not only worn but also implanted into bodies for communication, location, behavior, and health function monitoring. The negative impacts of this new technology include lack of privacy, decreased data insecurity, escapism and addiction, and increased social distractions [8].

The digital presence of people also include their digital interactions, and these are traced through a multitude of online platforms and media. Many people have more than one digital presence, such as a Facebook page, a Twitter account, a LinkedIn profile, a Tumblr blog, and an Instagram account [9]. These phenomena resulted in increased identity theft, online bullying and stalking, groupthink within interest groups, increased polarization, dissemination of inaccurate information, and lack of transparency, wherein individuals are not privy to information algorithms for news and information. Meanwhile, the use of artificial intelligence (AI) has become a popular approach in the development of new technologies. AI is good at matching patterns and automating processes, which contributes to the amenability of the technology to many functions in large organizations [10]. An environment can be envisioned in the future where AI replaces a range of functions currently performed by people. Such a replacement can cause job loss, lack of accountability and liability, legal changes, financial disclosure, and job risk automation. Thus, sustainable development is an essential component of STEM-based research.

Therefore, the concept of SDD is crucial in ensuring good well-being, which is not only beneficial as a factor of self-resilience but also advantageous to the environment and culture. The possible added benefit to any STEM-based breakthrough is the development of a strategic edge through the application of existing sustainable development models based on economic and environmental measures and social performance [11]. Sustainable development has been defined on the basis of various field applications [12]. Three common measures, namely environmental, economic, and social measures, have been considered in many field models for sustainable development. The environmental measure includes the dimensions of natural source usage, waste production by the industry, and pollution due to hazardous elements in air and water [13]. The economic measure is based on profit and loss of sales and investment and government texts. Meanwhile, social impact refers to the physical effects of the surrounding social environment, such as workforce stability or job security, social cost of health protection, employment rates, number of business partnerships, and percentage of workers with work-related diseases. These measures still lack technological spirituality despite their extensive acceptance in diverse fields. Inculcating technological spirituality into STEM for sustainable development is remarkably important.

Many educators have currently realized that introducing spiritual values to address the challenges brought about by the Fourth Industrial Revolution (IR4.0) is crucial. Numerous current publications presented a consensus that spirituality in technological development must be inculcated with respect to the sustainable development component [14]. Hence, the spiritual influence component in sustainable development would promote satisfactory moral values and build integrity among STEM-based practitioners. Lack of the spiritual influence component in STEM-based research will induce the emergence of new technological disruptions and environmental and mankind scandals due to decreased concern.
on moral and spiritual awareness and violations of integrity, which can challenge the legitimacy of an organization [15]. The presence of moral and spiritual components in new technological developments can provide sustainable improvements in society, which can help maintain market competition and dynamic work environments [16]. Conversely, a lack of spiritual influence component in new STEM-based inventions will cause poor values and moral humanities and even mental illness. Therefore, the influence of spirituality acts as an important component in new technological innovation and human lives [17].

In developing a consensus of the above studies, this paper aims to explore the STEM-based research practice concept by introducing the novel idea of integrating a spiritual influence concept for sustainable development by answering the following research questions: (1) How can participants apply STEM-based research for sustainable development? (2) How can spiritual elements influence and drive STEM-based research for sustainable development? This study argues that this newly coined concept on STEM-based research offers new technological developments with the addition of spiritual value. This approach is comprehensive for sustainable development to address the current challenges due to new technological disruption. This paper will first describe the meaning of the word spirituality before addressing the idea of spiritual-driven influence as one of the important themes of STEM-based research for sustainable development. Afterward, the STEM for sustainable development framework is eventually introduced as a novel concept before answering the application issues of the spiritual-driven influence component to STEM-based research for the sustainable development concept.

2. Definitions of Term

2.1. Spirituality

The study on spirituality begun a long time ago but has contemporarily increased since the 1980s. This component is gaining increasing interest, especially in nursing and applied fields such as education and social care [18]. However, no widely agreed definition of spirituality is available. Some defined spirituality as practical relevance and application of meaning and purpose [19], ethics and moral conduct [20], and individual ultimate ends and values [21]. The common concept is that individuals pursue a meaningful life through their humanity, society, people they care about, and through their jobs [22]. Spirituality generally pertains to a person’s philosophy of life and their beliefs regarding personal understanding, history, and education [23]. Spirituality is often viewed as a self-directed, mature, and mindful creation of the self and values [24]. Other scholars tend to refer to spirituality as a virtue of its qualities, such as peace, devotion, passion, elegance, caring, mystery, intuition, and wonder [25]. Spirituality is adopted as an essential aspect of life and involves self-faith, spiritual development, spiritual intelligence, spirituality in the workplace, and spirituality in psychology. Therefore, spirituality can be defined from different paradigms but remains essential, especially in the new technological development era.

2.2. Influence of Spirituality Concept

Western studies on spirituality were conducted by considering the issue of distinguishing between the concept of spirituality and religion [20]. Consensus regarding the difference between spirituality and religion is unavailable [25,26]. Studies that introduce separate views regarding spirituality and religion present the following paradigm: Spirituality does not focus on religion or on encouraging other people to follow a single belief structure [27]; individuals may engage in religious practices without spiritual knowledge and possess spiritual experience entirely beyond the religious context [24]. The development of spirituality in the religious context must be cultivated through the belief in God, by being honest, and by performing religious practices [21]. Therefore, the largest distinction between the two is that religion has laws and basic principles that must be followed on the basis of sacred and faith concepts, whereas Western spirituality only refers to the philosophy of life, attitudes, and values.
2.3. STEM-Based Research for Sustainable Development

Ideally, spirituality is beneficial for sustaining new technological development. The concept of spirituality for STEM for sustainable development is grounded by virtuous and positive value based on the aforementioned discussion. Therefore, STEM-based research for sustainable development can be defined as research involving the STEM approach (i.e., integrating science, technology, engineering, and mathematics), which is beneficial to maintaining the survival of economic, social, and environmental components. This concept can be built with the influence of spirituality to drive development (SDD) fundamentals in STEM-based research by the incorporation with elements such as beliefs in religious and ethical values for the survival of mankind. This concept is intended to convert the STEM-based research approach into a profoundly inspired and motivated methodology. In addition, STEM for sustainable development is built within a specific motivating paradigm that stresses the integration of faith and altruistic love [28]. Recommendations indicate that any new STEM-based research for sustainable development should have the following elements: high degree of happiness with life, such as serenity, joy, and peace; purposeful and fulfilling life; capacity to pursue inner beliefs; and continual self-growth and self-fulfillment [29]. These values will produce ethical STEM workforces, which, in turn, results in the creation of innovation that introduces well-being to mankind. By considering spirituality, STEM for sustainable development agenda can provide positive feelings and interactions regarding personal or social contexts [30], establishing good interaction toward new technology. This finding is consistent with the idea of spirituality, which can create positive emotions, experiences, happiness, and completeness through connectivity to new technology and generating a sense of well-being and convenience with respect to the social environment [31].

A positive sense of connection between humans and new technology is a major indicator of psychosocial well-being [32]. The positive interaction between mankind and technology implies the close interrelation of space and well-being [33,34]. The effective management between mankind and new technology and work environment commitment creates the so-called technological socio-physical space, which contributes to psychological well-being. Positive psychology has made considerable efforts into researching how humans react and adapt to their technological physical environment, particularly under unfavorable conditions. Spirituality in the technological and physical environments is related to personal growth, meaningful and enjoyable work, kindness, well-being, and dedication to technological innovation integrity [35]. Individuals that are motivated by faith and those that are positive can demonstrate healthy behaviors and values, such as reliability, fairness, trustworthiness, and dignity [36].

3. Study Methodology

3.1. Case Study Methodology

Site and informant selection in this study was bound by access to the sensitivity of outstanding scholarly based achievements of informants and investigator observations on their STEM-based research achievements regarding their career as academician scientists in a Malaysian public university.

3.2. Researcher Observation on Academician Scientists in a Malaysian Public University

Participants in this study were chosen from Malaysian public university scientists with outstanding achievements (e.g., awards of the most influential scholar in their research field). In addition, this research participation was derived by the interest of informants on STEM-based approach on their fields. Moreover, considering the professional research perspective, the chosen participants demonstrated successful contribution to STEM-based research as part of their academic career and published their research internationally. For example, one of the Malaysian public university scientists was selected in 2014 as the most cited or most influential scientist in the world for the field of physics mathematical modeling. This outstanding achievement can be taken as a role model of excellence and
competence of other research-based careers for future sustainable development. Based on the aforementioned observations, this study focused on the involvement of university academician scientists in STEM-based research and the establishment of sustainable developments considering the influential role of spirituality as a driving factor.

This study concentrated on a faculty perspective given the researcher’s position as a senior lecturer, with interest in the phenomenon of spirituality influence as a driving factor in the STEM-based approach of research projects. Opinions from the perspective of other faculty scientists were sought to confirm or disconfirm every aspect to be investigated before executing this study. However, data collection focused only on those scientists with STEM-based research informants. The justification of the researcher is two-fold. First, a considerable amount of professional and regulatory literature is devoted to the perspectives of scientists on STEM research, incorporating publications and documentations in the faculty. One of the chosen participants is a prominent scientist who is well publicized at the international level. Meanwhile, the academic literature of STEM practice considering spiritual influence as a driving factor is still limited. Theories may differ from practices, but the researcher has had the opportunity to observe both in action. Participants have also been engaged in STEM research at different public universities. Moreover, the participants have joined in professional research as university lecturers, thus, giving them some exposure in practice as opposed to theory. Therefore, the researcher aimed to balance the integration of the perspective of STEM-based research scientists with spiritual influence as a driving factor on their academic journey.

3.3. Methodology of Single-Site Case Study

Obtaining access to essential data regarding such a phenomenon is a vital concern due to the sensitivity inherent in analyzing intra-organizational practice considering sustainable development. The extremely limited number of studies related to higher education of spiritual influence as a driving factor considering STEM-based research practice possibly supports this assumption. Therefore, the chosen study site institution was based on typicality as a considerably high research-intensive institution, the capacity to gain access to institutional data, and the faculty with STEM-based research. Data related to the research of individual participants are confidential. Thus, familiarity with the investigated site institution was cautionary; without familiarity, possible access to such sensitive information is uncertain. However, such familiarity demanded constant alertness and continuous reflection on the potential for subjectivity to influence this study, data collection, and analysis. This study was conducted at a public research university located in central Malaysia based on the aforementioned constraints. The university was classified among institutions with considerably high research activities in Malaysia. The information of university scientists to confirm high research activity was provided by the faculty website, and Google Scholar supported their published scientific articles.

3.4. Informant Selection

Data collection of this study included tenured or tenure-track faculty who were active as principal investigators in STEM-based research with a high citation index. The predominance of STEM field research is highlighted by STEM-based researchers. These individuals were assumed to have the expertise and experience necessary for this study context. The informants were selected through purposeful and snowball sampling techniques. The available participants from an initial set were determined through the university website and publicly available records, and contact was made via email in order to identify interested and willing faculty in the participation of this study. From this purposeful selection of active respondents, a request was made for suggested contacts of other scientists (snowball sampling) in order to ensure the inclusion of active scientists in STEM research. This selection method aimed to interview faculty members across a representative spectrum of STEM research. Some of the 26 potential participants were contacted, and only seven agreed to participate in this study. Thus, only tenured and tenure-track faculty individuals
(i.e., participants from University B) were selected for this study. The current study focused on the STEM research practices of traditional faculty among senior lecturers, associate professors, and professors. Table 1 was constructed to examine and reconfirm the potential university participants for this study.

Table 1. List of potential universities with STEM-based research.

| STEM Research Interest                                                                 | STEM-Based Research                          | University |
|---------------------------------------------------------------------------------------|----------------------------------------------|------------|
| Mathematics Numerical Analysis and Computer-Aided Geometric Design                    | Mathematics and Engineering                  | A          |
| Engineering Geology, Environmental Geosciences, and Geophysical Sciences               | Engineering                                  | B          |
| Material Science and Thin-Film Materials                                              | Material Science                             | B          |
| Condensed Matter Physics and High-Temperature Superconductivity                       | Mathematics, Physics                         | B          |
| Physical Oceanography and Climatology/Climate Change                                 | Environmental, Physics                       | B          |
| Paleontology, Stratigraphy, and Geo-Heritage                                          | Biology, Physics                             | B          |
| Environmental Geosciences, Mining and Exploration Geology, Water Resources, etc.     | Environmental, Geology                       | B          |
| Solar Energy Photovoltaic and Thermal systems                                         | Physics, Engineering                         | B          |
| Fluid Dynamics, Numerical Methods, Instability of Fluid Flow, and Analytical Methods  | Physics, Engineering                         | B          |
| Mathematics, Dynamical system, and Pure and Applied 2D Geometry                       | Physics                                      | B          |
| Mathematics, Complex Analysis, and Geometric Function Theory                          | Mathematics                                  | B          |
| Photonics, Ionization Physics (High-Voltage Technology), and Laser Technology          | Physics                                      | C          |
| Theoretical Atomic Physics, Computational Physics, and Numerical and Computational Mathematics | Physics                            | C          |
| Statistical Modeling, Inference, and Distribution Theory with Focus on Models for Physical and Biological Systems and Image Analysis, Statistical Computation, and Simulation | Mathematics and Computer Science            | C          |
| Physics (Elementary Particles and Complex Systems) and Computational Sciences         | Physics                                      | C          |
| Medical Physics (Imaging, Therapy, and Radiation Protection)                           | Medical Engineering                           | C          |
| Atomic, Molecular, and Optical Physics; Quantum Optics; Nonlinear Optics; Optical Materials; Non-Classical Photons; Quantum Nonlinear Non-Photonics; and Novel Photonic Metamaterials | Physics                                      | C          |
| Material Science, Polymer Physics, and Polymer Electrolytes for Advanced Electrochemical Devices | Material Science                           | C          |
| Structural Geology and Tectonics, Sedimentology, and Environmental Geology             | Geology                                      | D          |
| Semiconductor Physics and Material, Thin-Film Deposition, Lasers, and Interaction Matter | Physics                                      | E          |
| Physics Optics, Optical System, and Devices                                            | Physics                                      | F          |
| Electrical Engineering, Applied Electromagnetics, and Remote Sensing                   | Engineering                                  | F          |
| High-temperature Superconductivity, Magnetism and Magnetic Materials Cryogenics, and Ceramics | Material Science                           | G          |
| Univalent Function Theory, Functions of a Complex Variable, and Mathematics Education (Graphics Calculator) | Mathematics                                  | H          |
| Biophysics and Bioenergy                                                              | Biology                                      | H          |
| Physics, Radiophysics, and Medical Physics                                             | Physics                                      | H          |
| Advanced Materials, Optical Materials, and Glass Ceramics                              | Material Science                             | I          |

The data revealed that University B has a significant number of scientists involved in STEM-based research (10 out of 26). Therefore, this study focused on scientists from University B. A letter of intent to conduct the study was then submitted to the dean of the faculty. Consequently, University B provided positive feedback, while other universities have not given any feedback even after the follow-up letter was submitted. Such a phenomenon is an unavoidable limitation in this study. Next, the focus of the research of scientists from University B was explored by identifying the involvement of every scientist with their specific areas of expertise. This information was obtained from the biography website of the faculty lecturer, and their published articles were reviewed by using the
Various search engines have a similar capacity to academic search engines and bibliographic databases (ASEBDs). These ASEBDs include Web of Science (WoS), Q-Sensei Scholar, Scopus, Google Scholar, Pro-Quest, and Ebsco-Host. However, a study conducted by [37] using the query hit count (QHC) measure found that Google Scholar has a higher QHC measure in academic and research scopes, which is approximately 398 million for January 2018 compared with other ASEBDs. Google Scholar is the choice of researchers and scientists due to its capability to provide researchers issues from the past to the latest issues [38], provide access to full-text data, demonstrate advanced search capabilities, and provide complete institution and researcher information [39]. Therefore, Google Scholar is selected as the participant search engine for the study participants. The list of participant names from University B scientists with the potential to contribute data in this study is presented in Table 2. The letters P1 to P7 were used to label the names of the participants among the scientists. Moreover, information, such as the number of published articles related to their study, is taken from Google Scholar.

The participants were contacted via email after obtaining permission from their respective faculty. A description of the purpose of this study and the expected contribution is stated in the invitation letter. The selected participants were required to provide feedback to the researcher on whether to accept or reject the invitation by using the acceptance form provided to ensure acceptance of the invitation. Finally, seven study participants voluntarily committed to contributing data to this study (labeled as P1 to P7). The selected participants have their advantages and strengths in data contribution in this study. The following discussion is the justification of the advantages of the selected participants.

Participant P1

Participant P1 works as a professor in the Faculty of Science and Mathematics of University B. He has extensive experience in conducting research related to science, technology, and engineering using mathematical modeling as a research priority. His research revolves around mathematical modeling in thermal physics and fluid systems. Among his achievements, he is named one of the three most frequently referenced world-renowned

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Table 2. List of participants’ research background (selected from University B).

| No | Participant Code | Participant Fields | Number of Articles (Google Scholar) | Number of Citations (Google Scholar) | STEM Research Interests |
|----|------------------|--------------------|-------------------------------------|--------------------------------------|------------------------|
| 1. | P1               | Mathematical modeling fluid dynamics | 394 | 5494 | Numerical methods on convection (Marangoni) |
| 2. | P2               | Human biological physics | 126 | 154 | Models and simulation of human movement and biomechanics |
| 3. | P3               | Mechanical engineering and manufacturing | 93 | 177 | Models of mechanical system industry |
| 4. | P4               | Environmental stochastic | 24 | 122 | Statistical models for energy, air pollution, and weather seasonality |
| 5. | P5               | Pattern recognition and image processing | 21 | 84 | Models of simulation on image processing |
| 6. | P6               | Physics and renewable energy | 18 | 67 | Models of solar energy |
| 7. | P7               | Visual imaging informatic technology | 13 | 52 | Models of image and visual information |
scientists in the academic world by the rating body of the scientific article journal. The recognition was given for his field involvement for the years 2013–2014.

Participant P2

This participant is an associate professor at the Faculty of Science and Technology of the Department of Science and Mathematics at University B. She has extensive experience in conducting multidisciplinary studies related to biomechanics and human movement using mathematical modeling.

Participant P3

Participant P3 is an associate professor at the Faculty of Science and Technology of the Department of Curriculum Development at University B. He has extensive experience in conducting multidisciplinary studies related to innovation in the industry using mathematical modeling as a basis.

Participant P4

This participant is a senior lecturer at the Faculty of Science and Technology of the Department of Science and Mathematics at University B. She has experience in conducting multidisciplinary studies. Her research focuses on the field of artificial intelligence. One of her studies emphasized podcasting of weather seasonality using mathematical modeling.

Participant P5

Participant P5 is an associate professor in the Faculty of Science and Technology of the Department of Science and Mathematics at University B. He has extensive experience in conducting multidisciplinary studies considering image recognition using mathematical modeling as a medium.

Participant P6

Participant P6 is a professor in the applied physics program at University B. He held the position of Department Head of Physics from 1990 to 1994. He also held various positions at the university from 1994 to 2002. His undergraduate educational background is in physics. He then pursued a master’s level education in mechanical engineering and earned a Doctor of Philosophy Degree in the field of renewable energy. He is one of the first people to conduct photovoltage studies in Malaysia using mathematical models.

Participant P7

Participant P7 is a professor in the Center for Visual and Informatics at University B. He has extensive experience in conducting multidisciplinary research in medical-related informatics visuals.

3.5. Data Collection and Analysis

Three types of data were collected in this study. Interview sessions were conducted for approximately two to three rounds for every participant. The observation was performed with participant consent on their research activities, such as research discussion or meetings and classes conducted for their students. Document collection in this research was performed concurrently with the interview analysis process. This collection aimed to support the emerging theme during interview data analysis. The types of collected documents are based on the emerging theme.

Interviewing

Interview data collection and analysis were conducted sequentially with iterative processes. These processes were performed within approximately one year. Each interview was undertaken in the informant’s office during regular business hours, with the time and location entirely based on their preference. Interviews with the seven informants were recorded using a digital recorder. All the digitally recorded interviews were conducted
The interview was performed on the basis of the guidance provided by [40–43].

The leading questions for defining structural questions on previous STEM-based research included the following: “What was the research that implied STEM approaches?” and “How did you run your STEM-based research to provide improvement or sustainability to the production of new technology?” Contrast questions such as “What would you do to influence your STEM-based research in producing new technological improvements for societies?” were also provided. A follow up was conducted using the following exploratory questions to incorporate the key factors as identified in the conceptual framework: “How can STEM-based research be cultured for sustainable development considering spiritual technology elements?” and “How can faculty socialization and STEM strategy function for sustainable developments?” Brief memos of an interview were taken to raise questions or state preferences, and terms (e.g., participant observer vs. participant–observer) were handled. The recording and brief memos aimed to reduce the influence of the interviewer’s misinterpretation [40] and the tendency to summarize and familiarize them with participant responses. In addition, member checks were performed to confirm interpretation accuracy, with two informants reviewing the individual transcript records of each other.

The transcription time of the digitalized interviews for a specific participant was taken on the same day as the interview processes, playing and replaying each interview at least three times to ensure the transcription of every word and sentence fragment. Afterward, all transcripts of the seven participants were consolidated into a document. An Atlas.ti software package was used for qualitative data analysis. The definitions of sustainable and spiritual influence as a driving factor of development were used as a guide for the main themes. The emerging elements and indicators were then inductively deduced. All the transcript data were subject to a process of screening word by word, by sentence fragment, and by full sentence for all participants. The elements and indicators were managed using the Atlas.ti software from the recorded transcript of the informant.

The reference points outlined as defined earlier were used to evaluate all transcripts. Maximum coding was intentionally performed (i.e., to avoid biases and assumptions). If any word, word phrase, or sentence included any reference link to the elements, then they were included in the elements for that theme. Each step of the review required checking the reliability of the interpretations by using the definition as a guide. Determining the existence of an alignment between the understanding of informants and operational definition is guided by the theme definition. The use of operational definition before data collection is one method to confirm external reliability [44]. The use of operational definition drawn from the literature, themes, elements, and indicators is connected to the constructed operational definition.

The themes were set against the following corresponding key factors using the operation definition as a guide: external environment, internal environment, role of success, affiliation, knowledge, authority, actors, and decision making. These factors were arrayed along with the indicators of context and resource needs, content and resource values, and contest and resource allocation. The research assumed that the elements would reflect and highlight the conceptual model and prove or disprove the feasibility of the organizing themes. Multiple queries, which started with word frequency queries, constant comparison analysis, and domain analysis queries, were utilized to package and re-package the data. A set of analytic memos were also created, distributing data across the operational definitions. This approach aimed to determine data alignment with the definition.

While coding, particular elements for the context of sustainable developments in STEM culture aimed to build moral and ethical values in life. This theme included the following emerging elements: (1) internal strength from maintaining the religious value, (2) honesty in performing tasks, and (3) building inner strength through self-belief and ethical value. The improvement of STEM career competence involved following particular themes: improving interdisciplinary management, enhancing the capability to expand
the contribution of specific fields, obtaining outsource support, enhancing innovative enterprise, and improving thinking capabilities.

The resource focused on the theme of STEM approach research practices. The research design established the relationship of the theme, elements, and data sources. The inductive, theory-driven coding incorporated all the aforementioned themes to search through the words of informants. Although interview data were the primary source, the document sets, such as research articles, activity photos, and research scholarly activities, were taken as evidence. One aspect of this study is completely understanding obligations by focusing on perspective STEM approach research and spiritual influence as a driving factor for technological development.

4. Study Result

The transcribed data interview analysis was formulated with respect to emerging STEM for Sustainable Technology Development (STEM-STD) under two main themes: the influence of Spirituality-Driven Development (SDD) and STEM for Career Competency (STEM-CC). These themes explained the application of STEM approaches of participants in their academic research career by inculcating the spiritual-driven elements.

4.1. Theme 1: Spiritual-Driven Development (SDD)

The influence of SDD is an emerging theme that comprises the following three elements: moral and ethical values in research projects, honesty in performing tasks, and building inner strength.

a. Moral and Ethical Values

One of the main objectives included in STEM research projects involves the use and innovation of new technology. The development research compliance of new technologies is ensured by SDD. Simultaneously, the research project aimed to support sustainable developments in innovating new technology. These themes comprise the following elements: courage in obtaining sustainable development by being noble in research intentions and setting objectives and activities of the research project for social well-being. This finding was highlighted from participants P1, P2, P4, and P6. An example statement from P6 is as follows.

“The using and innovating of technology should in appropriate for manner, we also need to know how to use and be able to use and produce new technology for the right way and with the appropriate manner. The results we get could be in terms of the new technology which is related with science and engineering.” 13.20 (P6).

b. Honesty

One of the aspects related to the spiritual element is honesty in performing research tasks for a career. Most religions believe that this element is an important aspect to succeed in daily life. The interview data revealed that cultivating honesty in research must start in the early stage of the learning processes, as indicated by participant P3. This practice can be particularly performed by project research students as a priority when conducting research activities related to STEM. For example, this element was interpreted from participant P3, who explained that students from every research class he had are always reminded to conduct research projects honestly.

“I’ve always given instructions to my research students . . . if you take an idea from the Internet blindly, you’re not honest with yourself . . . I do not know . . . if you’re not honest . . . your finding would not be the best . . .” 3:50 (P3).

c. Building Internal Strength

An aspect that is not particularly related to STEM-based research activity is the element of building internal strength. Interview data revealed that building internal strength is practiced all throughout life and can affect the career of a person. Some of the research participants indicated that spirituality established from ethical and moral values can be
developed by fulfilling religious beliefs and moral aspects. Furthermore, improvements in social well-being and economy and environmental sustainability, which directly impact self-career and personal development, are motivated by these aspects. The performance and maintenance of religious regulations by the participants, such as praying five times a day on daily working hours, prove the belief practices based on the data. For example, these elements were interpreted from the recorded data from participant P3, which highlighted the maintenance of religious rituals as the main priority in daily life. This factor is believed to be a spiritual element of integrity development toward work ethic, which is not only observed in STEM-based research but also in every aspect of life.

“... so I try to keep this concept...when I’m in meeting for a research for example ... when it comes to prayer time ... I put it as the first priority ... no matter what happens ... I give the analogy ... if we want to get rid of the water ... can we get out of the meeting room? ... off course we can right ... but why with the prayer we could not go out? ... so I said like that ... so let me out ... even if you do not want to go for prayer ... it is up to you ... you could continue ... because you do not feel like defecating ... but I felt ... like that ... for me, I have such concept ...” 3:92 (P3).

Particularly, STEM integration programs and research demonstrated the cultivation of building internal strength to face challenges such as self-efficacy. For example, participant P3 indicated that happiness in jobs can be achieved by performing moral and religious values in daily tasks. Thus, internal strength can be reinforced to facilitate every aspect related to facing any challenges during a career as a scientist, as stated by participant P3.

“... it is in Islam ... we need to pray in time to congregate ... others would be all clear ... we follow what God had tells us ...” 3:90(P3).

“... so far what I feel ... I feel those values when we delay ... what’s the ... these concept makes me happy in my job ...” 3:91 (P3)

4.2. Theme 2: STEM for Career Competency (STEM-CC)

STEM for career enhancement through research competency was observed among participants to realize sustainable development through four main elements. These elements are as follows: (1) STEM approach aims to enhance the capability to expand specific field contributions; (2) STEM approach aims to improve interdisciplinary management; (3) STEM approach facilitates outsource support; and (4) STEM approach aims to enhance innovative capability.

a. Enhancing the Capability to Expand the Contributions of Specific Fields

The element of being a sensitive observer helped in enhancing career competency through the STEM-based approach. For example, this element could be interpreted from the interview recording data of participant P2. Participant P2 explained that researchers are trained to be sensitive observers. This characteristic is necessary especially when observing a specific phenomenon during analysis to formulate certain phenomena beyond their field expertise. For example, results from a specific computer analysis software could be inaccurately interpreted when someone is not an expert on the software. The interpretation and formulation of a phenomenon could result in incorrect and inaccurate solutions due to the lack of expanded specific fields. This situation is described by participant P2 as follows.

“... it would be a problem for researcher who like to use a software blindly ... because they don’t know what they want. Of course, it will generate a result, but they don’t know the meaning. If they don’t know the orientation for example, they just enter a value, the result might be reversed. For example, if the movement is backward, but they keep on entering the value without knowing the orientation the result would be forward. In other words, they don’t know the theoretical aspect ...” 2:119 (P2).

b. Improving Interdisciplinary Management
Another element in this study is the ability of a participant to engage in multidisciplinary research management. In this case, mathematical modeling is one of the research fields where the STEM integration approach could provide an opportunity for collaboration with other research fields to address a specific problem. Multidisciplinary management is conducted by determining the introduction of advantages through their field. For example, this element is realized by organizing the collaboration of different fields to solve a specific problem as stated by most participants. Interdisciplinary management is normally conducted through research meetings held for specific projects (i.e., strong evidence can be triangulated through observations on a research meeting attended by all participants P1 to P7). For example, P5 collaborated with PDRM and KTM to manage and share their specialty.

“... in addition, there was forensic research ... in the forensic study, it would involve collaboration and arrangement with police forensics ... mathematical modeling would be used in this particular field ... in fact, every research has its own mathematical model ... statistics, for example, is widely used in many research fields...” 10:15 (P5).

In the context of career competency, the element of interdisciplinary management is an important aspect across most participants for sustainable career development. This element encourages various disciplines to sit together in order to discuss research objectives and progress to achieve similar aims. For example, P5 explained that an observation conducted for mathematical modeling research was managed by collecting many different existing data from several different fields. This approach could only be performed by managing and organizing several fields to sit together. The interview articulation for this element from P5 indicates producing an observation to generate mathematical modeling for specific systems in the field of climate change, which is performed through management and arrangement with other department fields.

“... based on the previous data, we could generate mathematical model by looking at changes ... it would generate a pattern ... it could be done from the simplest one to the most complicated one ...” 4:28 (P5).

In some certain cases, good interdisciplinary management could also contribute to product patents and commercialization. The comparison of some of the research participants revealed that participants with good interdisciplinary management produced patents and commercialized their research outputs. However, participants with minimal interdisciplinary management showed that some afforded word patent and commercialization:

i. Cases for good interdisciplinary management yielded patents and commercialization (i.e., interdisciplinary management from visual informatic fields with the medical field to produce tangible innovative medical products). Evidence in the pictures and document format for this element was not presented due to some terms and confidentiality.

“Ortho-knee was ready, Ortho-Hip is still in progress ... Ortho-Knee has been patented ... it would be our trademark ... to be used in HUKM ... now HUKM has been using Ortho-Knee for two years ...” 9:68 (P7).

“We make it, then we sell to people ... we’ve been using it for two years ... people were convinced ... we do not ask others to use it ... but we want HUKM to use it for two years ... then we got feedback on things to fix ...” 9:69 (P7).

ii. Cases for minimal interdisciplinary management (i.e., produce software without patent). The P3 project output was software for the measurement of industry innovation capabilities and company performance, which disregarded the implementation with industries. Thus, if the project with numerous parties involves interdisciplinary management, then this project has the potential to be patented and commercialized.

“It's been said that it is possible to make a patent ... but we have not done it yet ... moving towards the patent needs to fulfill the features of patent ... but, our products are just software ...” 10:21 (P3).
Figure 1 shows strong evidence for this case in the form of a published document as a research article to demonstrate the importance of interdisciplinary management for further steps in producing patent and commercialization from P3.

![Diagram of innovation capabilities](image-url)

**Figure 1.** Theoretical outcome application in software as research output (i.e., framework for innovation capabilities of the large Malaysian companies). Source: P3 published article document [45].

Additionally, the element of competency on research tasks can be categorized in career competency and has interrelation with the concept of improving interdisciplinary management. This element was generally interpreted across all participants. For example, participant P3 stated that he would compete in various contexts, from the aspect of self-management to project and research management.

“I do not like anyone else to come first . . . it could be understood . . . I would be the first person to open the fence or open the lights . . . I like that . . . but now I could not fight . . . Prof Isaac was much earlier . . . ” 3:30 (P3).

Compared with P1, he also has the same principles when performing research tasks but at a further level of competition. Participant P1 explained that he was competing to publish an article with an overseas lecturer on research concerning mathematical models for mechanical fluids.

“. . . I submitted a paper, and I compete with a professor . . . I don’t think that he’s a fluid expert . . . but he is a numerical expert . . . when I sent the article, he was the referee . . . then I found out that my paper took a very long time to review . . . it might be him keeping it too long . . . he mastered (the) in method . . . it might be when he saw my equation . . . ” 8:34 (P1).

Furthermore, the above interpretation from P1 revealed the element of self-enthusiasm in conducting research. Participant P1 stated that he could usually complete a task quickly and diligently, thus demonstrating self-enthusiasm.

“Oh, I’m quick in doing my assignment . . . when I was a student . . . I bring home my work . . . ” 8:42 (P1).

An important element in conducting multidisciplinary research is diligence, as indicated by the interpretation from P5.
“We could see ... some people are very committed ... if he or she is committed, he would have no problem. He can change his interest later. It’s like people said interest can be nurtured, so that kind of person would have no problem ... but we have to ask him, and he said he was like this. I do not know the beginning ... but later, the interest would come in ...” 10:52 (P5).

This quotation revealed that commitment to the tasks indicates diligence and enthusiasm in conducting research. Interest in any field can also be fostered by such passion. The element of punctuality could be described in career competency. Such a description is due to the possible involvement of integration in the coordination of various areas of science, which must be tailored to certain times and tasks. This element was interpreted from P1 and P2.

“The main obstacle is time ... but I would see it as a barrier ... besides lecturing, we also have a lot of work ... there are many other tasks to be done ... we need to do research, writing, students’ supervision ... all we have to do ... so in our project ... we have to make sure when we say that it can be ready in eighteen months ... we have to try to complete it within eighteen months ... it could not be extended for another couple of months ...” 9:54 (P1).

“We are here not only to teach ... we need to have our publication ... at the same time we have to do research project.... we also need to contribute to the society ... go to the rural schools. It’s our research work ... so for me it’s the time awareness ... it’s a challenge and we have to be clear ... so it’s my plan to do this project ... we need to have a Gantt-chart ... so we can trace where we are...it’s the ultimate challenge ...” 9:55 (P2).

c. Outsource Support

STEM-based research can improve career competency by identifying outsource support, which is another emerging element. This element is interpreted on the basis of different participants. The data revealed that outsource support exists either from external or internal institutions in the form of a research grant or sharing specific expertise when conducting certain STEM-based research. The data as stated by participants P3 and P1 provide a clear interpretation of this element.

“We try to take advantage of it (STEM approach), and we try to get other agencies to work together in our fields ... so we can share our knowledge ... that was the most enjoyable moment that I had ever experienced ... for example with KTMB (Keret api Tanah Melayu Berhad) ... we got the project from KTMB and support by MITI ...” 12:17 (P3).

Financial support, which is an essential factor needed by most researchers, especially for an academic career, will be provided by the research grant. Almost all research participants stated this element as follows.

“It is hard for mathematics field to find a research grant ... when I came back in 2000 ... I knew there was no mathematics lecturer who got the IRPA grant ... I applied but they didn’t accept because we were in the mathematics discipline ... this is because mathematics is a basic discipline ... so they don’t really understand ... so many mathematics lecturers didn’t submit the application for this grant ... it shouldn’t be like this ... I’m the first person who got this IRPA for mathematics ...” 8:44 (P1).

In addition to the research grant, specific skills and expertise are also types of support that could improve academic career competency. The limitations in skills, expertise, and available facilities contribute to outsource support on certain expertise from external companies. The STEM research approach provides an advantage for participants when conducting research in other fields. The data taken from participant P3 demonstrate this situation.
“Some external support is not available in our country, based on my experience abroad... if we are looking for customized prototype... we can find any company to fabricate for that particular purpose... but in Malaysia there is no one except in particular... factory or company... but the price is very high... because one needs to fabricate... customize... so the innovation is growing due to that kind of support... we have an idea, but we cannot create the prototype... ” 3:14 (P3).

Another factor considered to be a basic element is equipment support, which can be realized by collaboration with another institution as mentioned in the STEM approach in education. The collaboration using the STEM approach as stated by participant P5 could also require equipment, such as high-end computer systems with high capabilities and speed for data processing.

“In terms of equipment... for example, we can get it from PDRM... such as a computer system... our part is more on algorithm... so more on machine learning. If we need a lab... we’ll work with biologists...” 11:13 (P5).

d. Enhance Innovative Capability

The interview data analysis revealed that STEM integration could encourage participants to improve innovative capabilities. In particular, such an improvement could be observed when the production of ideas or products from research projects of participants using the STEM approach could generate new mathematical models. For example, new software that can be used for educational and in-hospital medical imaging purposes has been developed by participant P7.

“I use simple Computer-Aided Design, we create our program for high school students drawing... we want them to draw using anything using mouse in the design subject... this software can actually be used in all Selangor technical schools...” 9:3 (P7)

“... intellectual properties... but I have this stuff, not for sale in the market... it is a small one... could be used for a hospital...” 9:71 (P7).

In another situation, participant P3 explained that a student or lecturer can provide an innovative idea for a research project. The application of a concept or product could demonstrate the innovative idea capability.

“The important thing is that we need to understand what should student need to do in a research project... if the idea is from the lecturer, we need to explain. Sometimes students don’t understand, and then it will cause students doing it halfway...so we have to explain the result that we expect from the research. As a forensic student, students should know what is the research goal. For example, student can build a model pattern database for Malaysian ink code identification as Malaysian police still don’t have ink recognition purposes...” 10:36 (P3).

For example, data revealed that an innovative element can be a reality, a book publication, or new technological product development that occur during the academic career path.

“It is not just an article... for a PhD student... but we don’t want to stop until we can confirm ourselves, right... if we can do it... make it... I have that kind of student... he not only produces a thesis, but he produces a book from his thesis...” 12:24 (P7).

For the case of SDD, participant innovative enterprise is proven by the publication of books on the concept of STEM integration considering spirituality and human development. Books published by participant P6 are an excellent illustration of his views regarding the existence of STEM and the interaction of humans with technology based on STEM approaches. For participant P6, the development of new technology must consider spirituality for the sustainable development of mankind:

“I ended up writing these books... for example... Science Thauhidic... and this book is trying to put science in its place, and this is my experience of how we interact with the Quran... the Quranic touch to scientists... where the Quran touches us...” 7:28 (P6)
Innovative capability is also demonstrated by the element of article authoring for publication, which was interpreted from participants P2, P5, and P7. This element is highlighted for all participants and must be fulfilled in the career of academicians.

“...that journal is for people in our field...journals and conferences are to be done and we need five journal articles a year to be publish which are ISI-indexed as our KPI...” 9:59 (P2).

“Then other people have also written their articles, in the press not yet. There are also comrades, in SME magazine we have described the impact, like this KTM has been published in IMPAK magazine, meaning KTM has efforts...SME together to help them provide technical expertise in the country, how do we maximize the train scheduling for optimization, like this gun because it involves PDRM ...” 10:69 (P5)

“Okay...if a scholar presenting at a conference, or publishing a paper... only academicians read, and for the conference only the academicians will attend... that’s how it is...” 11:27 (P7).

An important element that STEM-based research could introduce for sustainable development through research competency is the ability to establish a new theory, concept, or method from specific STEM-based research. The interview data of participant P1 were used to interpret this element. Particularly, this element can be found in the context of developing a relatively new mathematical model, which involves the use of methods in solving a mathematical model.

“...there is one method...I know that method...it was used to solve only one equation...my expertise is in fluid mechanics modeling...I have to deal (with) maybe two or three equations...so I need to couple that method...it can’t be solved one to one...it had to be solved three times...no one could solve three equations...but I have solved it in one night...after then I wrote it in an abstract...I mentioned the words “we present for the first time”...those words are essential.” “we present the method for solving coupled system for the first time ”... no one ever does it ...I can do it... use the word for the first time.” 8:50 (P1).

“We get new equation...then it can’t be our model...if we throw away certain terms that we added...we can’t model the ones that we refer to...” 8:63 (P1).

“... a mathematician is to find an expression in terms of X ... what is the phenomenon of mathematical expression ... there are two behaviors...I use another method...when I multiply the X range, I find the extended equation behavior...so the behavior is above that region, meant to another physics property ... new physics inside ...” 8:65 (P1).

5. Discussions

The researcher used thematic analysis to examine the life experiences of the selected scientists. Obtaining elements from transcribed interview data is an inductive process based on the academic journey and experience of the selected participants. These scientists come from different religious and spiritual backgrounds but have collective similarities and harmony within their experiences. The obtained data were consolidated into two main emerging themes: SDD and STEM-CC. STEM-SD can be generalized by considering the process of strengthening individual scientists to address the challenges of STEM-based research for technological developments and manage new technological disruptions [7]. Such a generalization could be performed by using the STEM approach for sustainable development with the influence of spiritual-driven elements. The themes were conceptualized in this study to demonstrate the development of new technology through research project engagement by applying the STEM approach and the improvement of research career competency.

Three indicators can be used to explain SDD. The first indicator is moral and ethical values in life, which motivate a person to be responsible for sustainable development in producing new technology on scientific research. This element can also encourage
researchers and serves as a solution to new technological disruptions [7,46]. This indicator is observed through the ethical value performance via religious belief and honesty in completing research tasks (for example, setting research objectives to fulfill religious and belief obligations). The third indicator, which is building the inner strength of a person to address challenges, could be attributed to the aforementioned indicators. Consequently, scientists will improve the developments of new technology for mankind [35].

The second theme of STEM-SD is STEM-CC. Four main indicators can explain the use of the STEM-based research approach as discussed through this theme. The first indicator is the capability of the STEM integration approach for improving the competency of specific discipline field [47] contributions of a theory or concept for other disciplines [48]. Such an improvement could be facilitated by the second indicator, namely interdisciplinary management [49]. The constraints of cognitive skill ability in research can be addressed by enhancing interdisciplinary management [49,50]. Other indicators include critical and creative thinking, sensitivity to a specific phenomenon, self-competitiveness and task enthusiasm, and punctuality.

The third element of STEM-CC is outsourced support to perform research. The existence of various outside expert support entities, such as research grants, expertise consultations, and high-end equipment or facilities, is an indicator of this element [51]. Moreover, the self-continuation of technological research and development process can be facilitated by outsourced support. Such support can originate from internal or external institutions and in the form of a research grant, financial support, specialty, skills, and equipment. One of the outsourced equipment and skill support is the availability of certain institutions to produce customized prototypes, which could encourage self-motivation of participants on STEM-based research.

The improvement of innovative thinking capabilities is the last element for the STEM-CC theme. The ability to produce innovative ideas or products demonstrates this characteristic. The main indicators for the aforementioned elements are as follows: publication of books and articles; contribution of new ideas, concepts, or models; and generation of new innovative and useful ideas for sustainability development [52,53]. The improvement of knowledge and abilities in specific fields, such as science, mathematics, and engineering, can be attributed to these skills.

Data Triangulation

The emerging themes under the concepts of STEM-SD with the respective elements, indicators, and sources of data triangulation are presented in Table 3. The consistency of data triangulation from different sources (interview responses, observations, and documents) as commonalities emerged from a convergence of codes [54], and they were subsequently identified as elements and themes for realizing consistency and reliability of some of the elements.

The table reveals the development and confirmation of themes through the triangulation approach for supporting emerging themes from the interviews with documents and observations [55]. This approach provides trustworthiness for theme replication and transferability. Furthermore, the identification of data saturation can be performed through triangulation [56] by extrapolating the meaning from the interviews and the open-ended questions and observing the point at which no further new information was emerging. This process was conducted using Atlas.ti.

Figures 2 and 3, respectively, show the data triangulation (i.e., Figure 2 is for the influence of SDD and Figure 3 is for STEM-CC) themes collected from participants P5 and P6. The figures prove that participants P5 and P6 have innovated new technology and practiced the elements of SDD, such as moral and ethical values, honesty, and building internal strength for academic career competency. These elements were influenced by the practice of religious values, which is documented in books shown in Figure 2. The STEM-based research approach, which has a direct impact on career development, was used to solve problems.
Table 3. List of emerging themes under the concepts of STEM-SD.

| Concept       | Themes                           | Elements                                      | Indicators | Source of Data (P1 to P7) |
|---------------|----------------------------------|----------------------------------------------|------------|--------------------------|
|               |                                  |                                              |            | Interview | Observation | Document |
| SDD           | Moral and ethical values         | 1. Courage                                   | All        | P1, P2, P4, P5, P6      |            |           |
|               |                                  | 2. Noble research intention                  | All        | P1, P2, P5, P6          | P1, P2, P5, P6 |
|               | Honesty                          | 1. Noble research objectives                 | All        | All             | All         |           |
|               | Internal strength                | 1. Religious values                          | All        | All             | P6          |           |
|               |                                  | 2. Religious practices                       | All        | P5, P6           | P5          |           |
|               | Expand field contribution        | 1. Environmental sensitivity                 | All        | P3, P5           | P3, P5      |           |
|               |                                  | 2. Patenting                                 | All        | P2, P5, P6       | P2, P5, P6  |           |
|               |                                  | 3. Innovative                                | All        | All             | All         |           |
|               |                                  | 4. Creative                                  | All        | All             | All         |           |
|               | Interdisciplinary management     | 1. Competitiveness                           | All        | All             | All         |           |
|               |                                  | 2. Enthusiasm                                | All        | All             | All         |           |
|               |                                  | 3. Time management                           | All        | All             | All         |           |
|               |                                  | 4. Skill management                          | All        | All             | All         |           |
|               |                                  | 5. Research management                       | All        | All             | All         |           |
|               | Outsourced support              | 1. Support agencies                          | All        | All             | All         |           |
|               |                                  | 2. Process continuation                      | All        | All             | All         |           |
|               |                                  | 3. Prototyping support                       | All        | All             | All         |           |
|               |                                  | 4. Facility support                          | All        | All             | All         |           |
|               |                                  | 5. Equipment support                         | All        | All             | All         |           |
|               | Innovative                      | 1. Creativity                                | All        | All             | All         |           |
|               |                                  | 2. Creative enterprise                       | All        | All             | All         |           |
|               |                                  | 3. Publication                               | All        | All             | All         |           |
|               |                                  | 4. New concept, theory, or model             | All        | All             | All         |           |
|               |                                  | 5. Idea generation                           | All        | All             | All         |           |

Note. STEM-SD = STEM for Sustainable Development; STEM-CC = STEM for Career Competence; SDD = Influence of Spiritual-Driven Development.
The identification of data saturation can be performed through triangulation by extrapolating the meaning from the interviews and the open-ended questions and observing the point at which no further new information was emerging. This process was conducted using Atlas.ti.

Figure 2 and 3, respectively, show the data triangulation (i.e., Figure 2 is for the influence of SDD and Figure 3 is for STEM-CC) themes collected from participants P5 and P6. The figures prove that participants P5 and P6 have innovated new technology and practiced the elements of SDD, such as moral and ethical values, honesty, and building internal strength for academic career competency. These elements were influenced by the practice of religious values, which is documented in books shown in Figure 2. The STEM-based research approach, which has a direct impact on career development, was used to solve problems.

**Figure 2.** Data triangulation for the theme of Spiritual-Driven Development (SDD). **Source:** Segmented data from P5 and P6 using Atlas.ti.
6. Ontological Mapping of Themes

The technique proposed by Bazeley [43] is used to combine the emerging themes of STEM-SD with the SDD elements and to support STEM-CC. These relationships can be demonstrated by using ontological mapping, as shown in Figure 4. The exploration of the concept of STEM-SD revealed the existence of ontological logic relationship links of STEM-CC with the influence of SDD through the logic of “And.” Thus, new technology development considering well-being humanization is best practiced in the presence of SDD, and they could simultaneously develop research-based career competency. SDD is established ontologically with three main elements with the relationship “And.” Therefore, all elements, such as moral and ethical values, honesty in conducting research, and building internal strength, are compulsory elements for ensuring the sustainable development of new technology.

STEM-SD and STEM-CC are, respectively, constructed by SDD with the relation “And.” If the practice of SDD is included, then STEM-SD and STEM-CC were established. Such a condition is demonstrated by the indicators, such as enhancing the capability to expand specific field contributions, improving interdisciplinary management, obtaining outsource support, and enhancing innovative capabilities. All the SDD elements, such as building internal strength, demonstrating honesty in their work, and showing moral and ethical values, are practiced along their career path.
Figure 4. Mapping of STEM-SD themes and elements.

7. Conclusions

Incorporating the STEM approach with the spirituality concept [57–59] in current STEM-based research undeniably brings about the new landscape of technology development. This concept results in the adaptation of humans to nature and the relationship between mankind and technology and the environment through value and belief [1,2,6]. This phenomenon indicates that STEM-based research practice is adopted by many specific career fields for career development and competency. Meanwhile, the concept of SDD for sustainable development is closely linked with the continuation of the dimensions related to belief, value, religion, and spirituality for ensuring sustainable development. Awareness of such aspects provides an opportunity for university scientists to encourage frequent dialogues on societal learnings and knowledge through discourses. Sustainability for social development and growth can be enhanced and supported by the practices and encouragement of religious and spiritual belief elements. Scientists and educators who engage with the connection of the STEM approach with religion and spirituality represent the possibility of driving motivation for society on the impact of social well-being development. The
implementation of such concepts involves dialogues in society by inviting everyone to speak up.

Awareness of scientists or educators of the impact of the aforementioned concerns on their academic journey as a whole can be motivated by the findings of this study. Future research could investigate the specific themes found in this study. Moreover, replication of this study in other institutions with other research-based careers is possible. Exploring the experiences of other research-based programs, such as doctoral programs, could help in determining any similar elements. Possible generalization of the identified elements and themes to all scientists in their academic and career journey can be conducted through a quantitative study. Other populations, such as masters and doctoral students at multiple institutions, could also be investigated in order to explore multiple perspectives.

The participants of different religious and spiritual orientations could introduce the expansion of the formalization of the concept. Additionally, the participation from other faculty and expertise could result in the expansion of sampling in order to reach a diverse range of aspects and concepts. This study revealed that the concept of STEM for sustainability development could be used as a guideline to build new technologies for social sustainability. This phenomenon could be realized by influencing spirituality-driven development and practicing the element of STEM for the career competency concept. All these elements complement each other in the development of new technology for mankind, environmental, and economic sustainability, which is demonstrated by career competency [60]. Practicing the elements of STEM for career competency in specific fields provides clear objectives for the implantation of the STEM approach [61] for society. Consequently, innovative ideas among STEM practitioners can be developed. Therefore, individuals must build their inner strength (including moral and ethical values) not only for a scientific career but generally for everyday life aspects.

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