EXPLORING TEACHING OF SCIENCE IN THE NEW NORMAL: A GROUNDED THEORY

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This study explored the emerging categories in terms of delivering quality education of Science subject in the new normal setup leading to formulation of a theory based on the findings. It employed grounded theory research. In treating the data, Collazi's method was utilized to determine emerging themes. These identified themes were further analyzed using Interpretative Phenomenological Analysis, paving the way for the superordinate (SOT) and subordinate (ST) themes, coded and interpreted the responses of 11 participants at Cabanatuan City Schools Division. Individual interview was utilized as the principal mode of data collection.

With the above process, four key themes were culled which were labeled as superordinate themes. These were: focused learning competencies, relevant instructional materials, integration of multimedia and technology and learning competency-based assessment. The superordinate themes were further analyzed and assigned with subordinate themes as follows: for the focused learning competencies, the subordinate themes were compressed competencies through MELC; reduction of learning competencies; significance of learning competencies to learners' needs and context. For relevant instructional materials, the subordinate themes were adapting the self-learning modules; adherence and utilization of SLM from the National Office, Regional Office and Division office of Department of Education, and contextualization of SLM. As per integration of multimedia and technology, the subordinate themes were choosing appropriate multi-media and technology, and utilization of common social media platforms. As per learning competency-based assessment, the subordinate themes were alignment of assessment strategy to learning competencies and performance and output-based assessment.

Integrative Learning Pedagogy Theory in Teaching Science was crafted highlighting the superordinate and subordinate themes as its core principles. Hence, these key concepts were taken as conglomeration and encompassing theory pertinent to teaching learning process.

INTRODUCTION

The Department of Education has spearheaded the continuation of learning in basic education despite the pandemic caused by the Covid-19 virus. Months after the lockdown was declared, the decision to begin the school year 2020–2021 was made.

Expectedly, the community's adaptation to face the pandemic has started. Schools have resorted to a virtual encounter—the synchronous and asynchronous type of learning with students. On the other hand, it is not simply a transition to online modality, but a system that provides and uses technology efficiently. Most importantly, the school should be able to provide a positive educational environment, as well as equal opportunities to all students.

Related to this, the Department of Education, as per DepEd Order No.012, series 2020, had established and unconfined the Basic Education Learning Continuity Plan (BE-LCP) which serves as the guidebook of the schools to

ensure the safety of all stakeholders of the school, upon starting the school year 2020- 2021. BE-LCP streamlined the present curriculum and identified the Most Essential Learning Competencies (MELCS) that will be the focus of the coming school year. This allows students to become more skilled at 21st-century abilities, understand higher concepts, and contextualize lessons into real-life situations. Herein, teachers of the basic education make parallel the topics to be discoursed in MELCS; following its assigned program and providing an overview of what areas to impart.

Moreover, the Learning Continuity Plan (LCP) contains two major parts: the rationale and the operationalization home-based learning through modular, online or a combination of modular and online (blended approach). The rationale is an easy part of the LCP as it only indicates the nature of the school which include government recognition or permit number, accreditation, and its classification whether small, medium or big school. It also includes the location of the school, summary of the number of students for the past two school years, number of administrators, teaching and non-teaching staff, and number of classrooms and other facilities. The number of currently enrolled students are included in the rationale. In reality, this part shows a drastic decrease on the number of current enrollment in most of the private basic education institutions as compared to the past two years' data. This is because most of the students transferred to the public school. It was clearly stated by DepEd Secretary in the interview conducted by Rappler on 08 July 2020 that the transfer of students to public schools is due to the economic downturn. Parents who used to send their child in the private schools have lost their jobs during the pandemic. She also said that almost 200,000 students from private schools had transferred to public schools. The operationalization part of the LCP is a very comprehensive plan in response to the new normal in education. This part needs strategic planning and coordination with the stakeholders in order to come up with a comprehensive content as per DepEd guidelines. It includes 10 major contents which are school readiness, platform and support, content, assessments, teacher's preparation, learner's capability, parent's role, communication plan, continuance, and monitoring and evaluation. All these require proper preparation, brainstorming, meeting, survey and coordination. Briones (2020), DepEd Secretary, emphasized that the basic education learning continuity plan in the time of Covid-19 is the response of the department to the challenges posed by Covid-19 in the field of education. She pointed out that education must continue whatever the challenges and difficulties faced now and in the future. Thus, the LCP is an integrated output of the Department in consultations with advisers, legislators, executive directors, teachers, parents, learners and the general public.

In light of the aforementioned current state of the Philippine educational system, the researcher conducted this study. Specifically, this study aimed to explore how the teaching of Science arrangements including the focus learning competencies, instructional materials preparations, alignments made by teachers to deliver their lessons, motivations tactics and adjustments regarding assessments in the context of new normal through the thematic analysis of grounded theory. With great aspirations, the outcome of this exploration gave baseline data for educational leaders, teachers, parents, and, most importantly, learners. Whereas, such data contributed to existing enrichment of instructional tactics and modalities during and beyond these trying periods. Future scholars may also refer to this journey as they advance their empirical research.

RESEARCH PROBLEM

The study was a grounded theory exploring the emerging categories in terms of delivering quality education in this new normal setup leading to formulation of a theory based on the findings.

MATERIALS AND METHODS

Grounded theory is a form of qualitative research designs thus, this study employed this kind of design. Considering the definition of grounded theory in connection to qualitative research, this design is suitable for this study since its intentions was to investigate and examine teacher's assumptions and values regarding how the subject Science thought in the context of lockdown in order to discover an emerging theory.

A total of 11 participants were tapped from selected High Schools in the Division of Cabanatuan City to provide information on the topic teaching Science during the new normal. The content validity of the constructed interview was assessed by experts. Using scheduled interviews, responses were recorded to preserve the integrity of data. The participants were interviewed virtually via Zoom, Messenger or Google Meet.

In treating the data, Collazi's method was utilized to determine emerging themes. These identified themes were further analyzed using Interpretative Phenomenological Analysis, paving the way for the "superordinate (SOT) and "subordinate (ST) "themes.

RESULTS AND DISCUSSIONS

Since then, learning modalities have become an interest among scholars, attempts to determine its relevance and significance during the new normal.

With the above process, the following findings were established:

SOT 1: Focused Learning Competencies

In reference to the first theme that emerged from the responses, "focused learning competencies" was the superordinate theme that was identified. Majority of the participants unanimously mentioned that the learning competencies were made focused giving way to more specific learning competency.

Such findings confirmed the DepEd Order Nos. 12 and 13 s. 2020, Basic Education Learning Continuity Plan (BE-LCP) which stipulated that "streamlined the present curriculum and identified the Most Essential Learning Competencies (MELCS). This will be the focus of the coming school year. This allows students to become more skilled at 21st-century abilities, understand higher concepts, and contextualize lessons into real-life situations." As such, it can be construed that the backbone of teaching Science was anchored on the said promulgated LCP memorandum. This was a bold move for the entire DepEd as this was an abrupt measure to ensure that continuity of learning be met amidst the implications of the pandemic.

To be able to achieve the sense of being focused, the learning competencies were compressed to what was called most essential learning competencies (MELC). This emerged from responses as all of the participants have made mention of MELC.

This finding was found similar with the study of Gastar & Linaugo (2022) when they highlighted that alternative learning modalities becomes significant when MELC's served as reference of lessons in acquisition of knowledge and skills in the subject Science. The compression of learning competencies of the old normal to MELC in the new normal was evidently carried out in teaching Science in the Division of Cabanatuan City.

The second emerging subordinate theme refers to the reduction of numbers of learning competencies. The participants claimed that this measure was evident when the MELC's were identified by DepEd.

In the same vein when Mendoza (2021) asserted that identifying the MELC and distributing it in reference to lessons that must be covered was significantly correlated. This presupposes that teaching Science can be predominated by the number of MELC being included during the learning process within the context and timeframe of new normal.

It can be noted that the move to reduce the numbers of competencies was also attributed to "repetitious" mode evident in the Science curriculum guide.

Reduction in the number of MELC and at the same time, compressing them into a more focused sense and meaning, was in fact a positive action for teachers teaching Science. This also establishes the idea that quality is better than quantity. This means that, teaching and learning has to be anchored on the quality of learning modality rather than the quantity of lessons being facilitated to learners during the pandemic.

The focused learning competencies were further elaborated on its significance with the learner's needs and context.

Such findings uphold the importance of considering the needs and welfare of learners, which in fact, is the core-concept of learner centered principle within the teaching learning process. In fact, the welfare of the learners has always been the focal point of Philippine educational system as inclusive component of the K to 12 mandates (Bernido, 2021). While teachers were greatly challenged in terms of learning quality transfer, they were very much aware of their task of giving justice to prioritizing the learners beyond everything that concerns learning and growth of the students (Agayon, Agayon & Pentang, 2022). Furthermore, Rivera and Tanghal (2021) clearly stated that teachers were responsible for monitoring the development of the students. The learners may ask assistance from the teacher via e-mail, telephone, text message/instant messaging, etc.

In fact, there should be a consistency between the learners' needs and learning competency. Despite the spiral nature of the curriculum, where learning competencies were gradually carried to a higher level, by means of repetition, considering the learner's context have to be taken into account. That is why, the principle of contextualization always goes hand and hand with learner centeredness approach. With this being said, participants were right when they claimed that most essential learning competencies have to jive with the needs of the learners.

SOT 2: Relevant Instructional Materials

The second superordinate theme refers to the relevance of instructional materials. Majority of the participants have mentioned Self Learning Modules as a major component of teaching Science during the new normal.

Such finding was consistent with the directives of the DepEd to be more flexible in choosing which modality was suited for the school and students (DepED LCP, 2020). Most schools in the country have opted for modular learning as compared to online learning. The relevance of this instructional material relies on the capacity of majority of Filipino learners. Primarily, majority has no sufficient gadget and Internet access for sustained online learning modality. Even if they have, the cost of it will be another burden on their families. This was also in consideration that there are areas in the country with very low connectivity level. Thus, for most parents and students, use of printed materials or modules would be more relevant during new normal situation.

The relevance of instructional learning materials in teaching Science was amplified through adaptation of the Self-Learning Modules or SLM. Almost all of the participants have mentioned SLM as the standard learning material during the remote distance learning in the time of new normal.

This finding can be related to the study of Lopez et al., (2020) where it was determined that the use of SLM was one of the best practices during the new normal. Contrary, teachers and learners were found to encounter difficulties in utilizing online learning as a modality.

Although, there were barriers in the process of using the SLM, school and teachers have survived the school year by being innovative and resourceful. Supply of paper for printing modules was at time a problem for teachers. Hence, teachers made their way to overcome such problem. Instead of printing, teachers made use of electronic copy to address the problem of shortage in paper. Rivera and Tanghal (2021) pointed out that learners can access

electronic copies of learning materials on a computer, tablet PC, or smartphone. CDs, DVDs, USB storage, and computer-based applications can all be used to deliver e-learning materials, including offline E-books.

The relevance of instructional materials was also indicated in terms of adherence and utilization of SLM from national, regional and division offices of DepEd.

Such findings reflect the DepEd Memo No.18, s.2020 also known as the Policy Guidelines for the Provision of Learning Resources in the Implementation of Basic Education Learning Continuity Plan.

This adherence and utilization was a manifestation of collaboration between and among the various offices of the DepEd. This was considered milestone when it comes to the relevance of instructional materials which was found significant in teaching Science during the new normal.

The relevance of instructional material was also expressed in terms of contextualization of SLM. This means that SLM was further enhanced to be able to cater to the needs and context of the learners.

Teachers exert effort to meet the learners' needs. This finding can be related in the study of Coros (2022), it was reported that results have shown that senior high school students are generally satisfied with the implementation of modular distance learning. It was elaborated that modules were enhanced and contextualized activities were integrated in the existing modules.

Further, the contextualization of SLM was also anchored on teachers' and school's initiatives of implementing programs that ensures consistent communication with parents and children while at home. They were able to elicit additional information about the children as per their challenges and difficulties encountered in using the SLM.

SOT 3: Integration of Multimedia and Technology

The third superordinate theme was integration of multimedia and technology in teaching Science during the new normal.

Elicited responses from majority of participants were geared to a common thought of integration of multimedia and technology in teaching Science during the new normal. In such manner, technology and multi-media facility was necessary in reaching out to students.

These results can be related to the what Christian et al., (2021) has found in their study about virtual teaching in the new normal. They upheld that "the current COVID-19 climate has resulted in the restructuring of the educational system and the adaptation of technology globally, so as to portray didactic ideologies." Results of their study posited that "the use of virtual classrooms is deemed advantageous as it enables the incorporation of learning styles, decreases the incidences of learning barriers, allows for adherence of Covid-19 restrictions, and enhances mental encoding and information retention." Walker (2021) also made similar contention when perceptions of school heads about technology integration were assessed. Accordingly, principals were all supportive and actively providing assistance to teachers that integration of technology in the teaching learning process was very significant.

Even before the onset of pandemic, integration of multi-media technology has been there all along within the confides of the classroom. Hence, the shift to new normal paved the way for another paradigm of such technology integration, to which, educational leaders must re-think. Rethinking can lead to crafting new policies and adapting better practices more adaptive to a post-pandemic scenario.

The integration of multi-media and technology in teaching Science was complimented by choosing appropriate tools, software and applications. Majority of the participants have described their experiences relevant to this matter.

These results can be related to the proposition of Murod et al., (2021) where the need to create courses for crafting electronic-based technology multi-media technologies will enable educators to advance in integrating multi media and technology in learning process. Locally, Matias & Agapito Jr, (2022) penned that "with our current situation we became all content creator and through the advancement of technology, schools are also advancing their teaching strategy by utilizing multimedia presentations that would benefit the students." They also found that the majority of students claimed that multimedia learning helped to their creativity in performance tasks, and that the presence of creative and artistic visuals given by multimedia learning made them more focused and motivated.

Indeed, the appropriateness of multi-media and technology, when integrated in the teaching learning process would harvest beneficial results both to the teachers and learners.

Another emerging feature of multimedia and technology integration in teaching Science is the utilization of common social media platform.

These findings can be related to the study of Manalo, Reyes & Bundalian (2022) about the challenges and opportunities in online learning during the pandemic. Their findings revealed that majority of the students gained satisfactory rating when it comes to self-directed learning, learning outcomes, convenience and ease, and accessibility of classes through social media platforms as opportunities. With this insight, it can be construed that while social media attracts many of the students, which at times, tend to be more of distractions, can be channeled as a better way of capturing the student's interest in learning.

It is therefore relevant and significant that the right choice of social media platform be considered by teachers when they utilize it in the learning process. Science, as a subject that points out the importance of observation, experimentation and making judgments, can actually compliment to a progressive drive towards social media literacy advocacy in the context of educational setting.

The phenomenal addictiveness of younger generation to social media applications and platforms is in fact

must be diverted to something that is more educational and more meaningful inquire-based activities rather than mere socialization and leisure - based engagements in such platforms. Science teachers cannot be complacent but need to be proactive in making use of the social media platforms and applications as tools for higher order thinking.

SOT 4: Learning Competency-Based Assessment

The fourth superordinate theme that emerged when it comes to teaching Science during the new normal was the learning competency-based assessment. Majority of the participants have mentioned assessment as integral part of teaching Science.

Related to such findings, Ghezir et al., (2021) who conducted a literature review of competency -based assessment, reported that "results of this review paper indicated that competency based assessment can be a great approach to improve the teaching and learning process if teachers could reduce the barriers of its implementation."

With the compression of learning competencies to most essential learning competencies, the learning competency-based assessment can be a logical form of assessment but needs to be adaptive and coherent with the adjusted learning competencies. The transition from the usual traditional pen and paper classroom-based assessment types to online or modular learning alternatives learning measurements and evaluation has posed a greater challenge among teachers. The reliability of responses or answers of the learners may always cast a doubt, since the actual evaluation and assessment was not supervised or rather administered by the teachers. However, educational leaders need to further determine a more relevant means of gauging learners learning during the new normal.

The learning competency-based assessment was further characterized by subordinate theme of alignment of assessment strategy to learning competency. Many of the participants conveyed what they adapted as per assessment is concerned during the new normal.

In the study of Hill (2021), it was found that the students performed better and were satisfied using online learning. They were appreciative of the teachers' approaches where giving feedback was one best practice in assessing learners performance. This feed backing mechanism was appreciated by the participants.

Perhaps, thinking out of the box on the part of the teacher, would yield aligned assessment strategies in teaching Science. While the participants, given their resources and limited training they had during the pandemic, were all commendable in utilizing innovative yet adaptive tools in assessing learners' performance.

Thus, as long as the assessment tool is in synch with the learning competencies, a valid and reliable measurement and evaluation will be established.

The learning competency-based assessment as highlighted by the participants was also characterized by the performance and output-based type of assessment. Most of the participants had pointed to this perspective.

Correlated to this finding, the development of 21st century competencies and skills in science teaching and learning is a key strategic imperative (Mdlalose, Ramaila, & Ramnarain (2022). Corresponding form of assessment has to go side by side with this development. Hence, VanTassel-Baska (2021) argued that "performance assessment requires those individuals designing tests and other assessments to be creative designers, much like architects." Further, scoring rubrics need to represent the traits that are being tested, instead of what is easiest to score. This form of assessment also entails the administration factors, "including making the constraints of the testing process as realistic as possible."

All these being said, learning competency-based assessment has to be supplemented by alignment of assessment tools and strategies as well as employing the performance and output-based assessment. All the more, learning can only be measured unless being manifested and evidently being recognized succinct to other learners' context and environment.

The Integrative Learning Pedagogy Theory (ILPT) of Teaching Science

Based from the generated information, the ILPT of Teaching Science was crafted. This set of principles is primarily intended for teaching - learning paradigm that befits the context of new normal and even the post pandemic era. The basic idea underlies with the conception that teaching learning process is a conglomeration of various elements compounded in a given context and environmental limitations. Having said this, this theory is a manifold of human experience bounded by the educational system, the implication of the Covid-19 pandemic and the 21st century spectrum of information communication revolution.
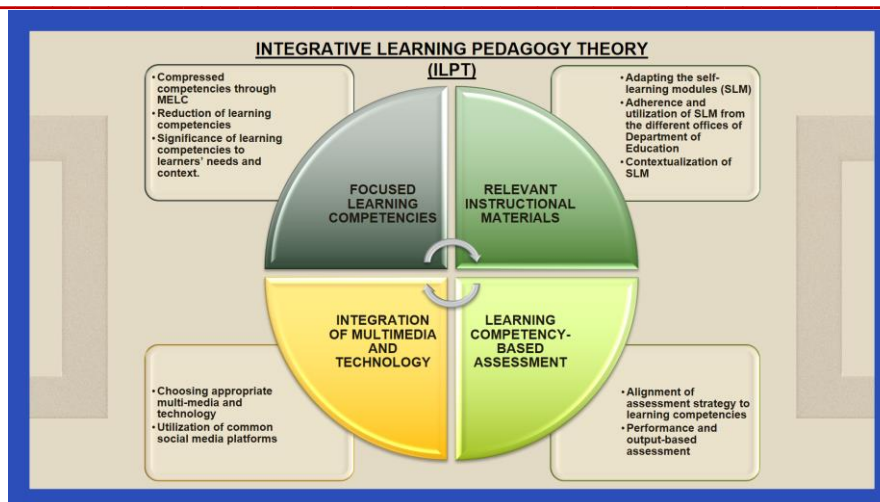
Figure 1. Visual Presentation of ILPT

The figure 1 offered the visual presentation of the integrative learning pedagogy theory. Taken from the very context of educators particularly those who are teaching Science, four core elements were defined such as Focused Learning Competencies, Relevant Instructional Materials, Integration of Multimedia and Technology and Learning Competency-based Assessment. However, these elements were not taken as standalone principle, but an overarching domains within the context of teaching learning process.

Further, each of the elements was assigned with sub components for the purpose of characterization and categorization, which delimiting its respective coarse and perspectives. As per the Focused Learning Competencies, it included Compressed Competencies translated to Most Essential Learning Competencies or MELC; Reduction in numbers of learning competencies and Significance of learning competencies to learners' needs and context.

On the other hand, having relevant materials in teaching Science during the new normal has also included the following such as Adapting the Self-Learning Modules; Adherence and utilization of SLM from the National Office, Regional Office and Division office of DepEd and contextualization of SLM.

As per the Integration of Multimedia and Technology, this was further described in another two sub topics such as: choosing appropriate multi-media and technology and Utilization of common social media platforms.

Lastly, the fourth component was Learning Competency-based Assessment. This was further characterized by Alignment of assessment strategy to learning competencies and Performance and Output-Based assessment.

The interconnectivity of these key ideas would be the competitive edge of the theory as each of the component complements the other.

CONCLUSIONS

Based from these findings, the following are concluded:
1. Teaching Science during the new normal may be dealt with various approaches. Hence, any approach must be appropriately adaptive of the learners' context and learning needs;
2. The vast experiences of teachers were filled with constructs and principles which directly addresses the gaps brought by the pandemic.
3. Preparedness towards a worst case scenario that led to changing a structured practice, is a necessary element towards resilience and mitigation.
4. Despite of devastating circumstances brought by the Covid-19 pandemic, there lies a handful wisdom which can be carried out towards a post-pandemic era.

RECOMMENDATIONS

Based from the proceedings of the research, the following are recommended:
1. Advise the curriculum planners and school administrators have to take into account the actual experiences of teachers for the purpose of initiating and implementing relevant programs for learners and teachers as well, under the circumstances of new normal.
2. The Science teachers have to exert more effort, advocate for collaborative teaching founded on empirical researches and alignment to current trends in teaching Science.
3. The students have to be more engaging in their studies and become vocal about their own learning needs so that teachers can find appropriate teaching strategies.
4. The parents are also recommended to be more participative in any school program or activities so that better collaboration between them and the teachers can be established.
5. Future researchers are encouraged to conduct similar topics which are quantitative in nature. This will further validate and establish the reliability of the findings of the study.

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