

# Evaluating of Science Integrated Curriculum Units at the First Stage of Basic Education in the Light of Next Generation Science Standards NGSS

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## Abstract

The current research sought to evaluate science integrated curriculum in light of for the next generation science standards, based on mixed method design where quantitative and qualitative data were collected using a content analysis technique that includes a set of indicators for NGSS standards in its three dimensions (practices, concepts, and core ideas). The analysis community included science integrated curriculum "discover" in first and second primary grades, the analysis sample included chapter two, theme one, entitled "Our Environment", "What do we see in the night sky?" respectively. Results showed that NGSS standards percentage included in first grade is 14.31%, 30.71% for second grade. Research recommended redesigning "curriculum units" In light of NGSS standers, curriculum general objectives, teaching methods, activities, educational technology, assessment methods, and the foundations for building a learning community.

**Keywords:** *Science Integrated Curriculum, Next Generation Science Standards NGSS, Evaluation process, Learning Community.*

## Introduction

The traditional view of learning has been changed from memorization information and facts in learning content to a new vision that considers learning as an enriching experience worth exploring and inspired by the learner's curiosity towards knowledge and inquiry that comes from the true desire to learn, so the active participation of the learner is one of the most important keys to success for a better future. Results of many previous studies indicated that teaching science integrated curriculum in classroom has contributed positively to improving the learner's performance compared to the traditional curriculum, as the learner

connects between different areas of knowledge and life experiences, which contributes to increasing critical thinking skills, self-confidence, and motivation to learning [1].[2]. when we want to applying of science integrated curriculum at primary stage requires several foundations as; Knowledge about learner and how he learn, partnership with parent, cultural and societal context, exchange of experiences between teachers, digital learning resources, an integrated of skills and values[3]. To development and applying of Science integrated curriculum require multidisciplinary overlap between Mathematics, Science and Technology, so learner can relate the concepts learned in one area to other concepts related to what achieves

meaningful learning [4]. Process to integration of curricula require use of modern technology that helps enrich learning experience such as Augmented Reality that link the real contexts with technological resources within all educational stages that studies science[5]. Integration requires linking learning content with realistic learning situations, by linking learning content fields such as science, arts, language and social studies, technology in addition to flexibility of learning environment so that it provides an opportunity for discovery, creativity and productivity [6] to develop the science curriculum in the preparatory stage in the light of NGSS standards, results indicated that all dimensions of the (NGSS) standards are included in science textbooks for the Middle stage with low percentage so research recommended applying more research is conducted to uncover the level of inclusion of NGSS Standards dimensions in various branches of science and various educational levels to know the strengths and weaknesses in the content[7]. Many Studies evaluated preparatory stage science textbooks in Egypt in the light of NGSS standers year of 2018/2019 indicated that all dimensions of “NGSS” standards are included in science textbooks for the Middle stage with low percentage so research recommended necessity of evaluating the science curricula across educational levels in light of NGSS standers [8].[9] .When we analysis science textbooks of first preparatory grade in Saudi Arabia to find out the availability of next generation science standards in the Content, the results indicated that NGSS included with a median percentage, recommendations confirm the importance of review science content in the light of NGSS. Implying more science and engineering practices, crosscutting concepts with the focus on the depth of the disciplinary[10]. The existence of NGSS standards in varying degrees in the ninth grade science textbooks in Jordan[11].

indicated that NGSS standards is deficient in the content “Energy” unit, as these standards were not included in the sixth primary, first and second preparatory grade science textbooks of

“Energy” unit in Saudi Arabia Kingdom[12]. percentage of including NGSS standards in physics textbooks in Saudi Arabia Kingdom was at moderate percentage[13].

### **Terminology**

**Evaluation** defines as review to what extent the curriculum achieves the NGSS standers and monitor points that require improvement [14].

**Science Integrated Curriculum** defines as curriculum that links multiple topics “Language, Mathematics, Sciences, Arts, Social studies and life skills” in a balanced manner to achieve primary school learning objectives [15]

**The First Stage of Basic Education** defines as first and second primary grades that study Science Integrated Curriculum in titled “Discover” [16]

**Next Generation Science Standards** defines as integration of science themes, science and engineering practices, main ideas, educational concepts and technological applications to achieve quality learning outcomes [17]

**Learning Community** defines as an effective learning environment based on a partnership between teacher, learner and parent to support learning experiences and life skills [18].

### **Methodology**

Science integrated curriculum should reflect the interconnected nature of science in terms of (practices, concepts, and general ideas), to achieve this, specific standards should expressed the educational stage objectives and define the learning outcomes clearly, Therefore, there was a need to evaluate the curriculum in light of the next generation science standards ”NGSS” to determine how the curriculum conforms with NGSS standards, in order to develop a guiding model for teaching this curriculum in light of NGSS standards, which is reflected to learning outcomes quality, So the current research sought to answer the following questions:

- 1) What is the scientific basis for applying science integrated curriculum at the primary stage?
- 2) To what extent are the NGSS standards achieved within science integrated curriculum?

3) What is the general framework for evaluating science integrated curriculum in light of the NGSS standers?

**Study Objectives**

- Identify the reality of science integrated curriculum at the primary stage in light of the next generation of science standards.
- Evaluate the science integrated curriculum in the light NGSS integrated standards.
- Develop the science integrated curriculum at the primary stage, In line with science global standards.
- Design general framework for evaluating science integrated curriculum units.

Content Analysis of science integrated science curriculum at primary stage in order to prepare a teacher's guide that achieve NGSS standers.

Research depended on mixed method research that includes both qualitative and quantitative data, The research tools included NGSS Standards document issued by the Education Research Center in California, USA content analysis technique that includes NGSS standards three dimensions (practices, concepts, and core ideas). The form included number of (lessons, pages, activities, and paragraphs in each lesson), percentage of each dimension.



Figure (1) Mixed method design (Creswell, 2014)

**Study followed these procedures:**

- Systematic review of previous studies to prepare a list of foundations for science integrated curriculum at the elementary stage.
- Systematic review of the NGSS standards document in its three dimensions.
- Content analysis of science integrated curriculum “discover” in the light of NGSS standers.
- Design lesson plan for applying science integrated curriculum.

- Suggest general framework for evaluating science integrated curriculum units

**Results**

In answer to the first question, to determine scientific basis for applying science integrated curriculum at the Elementary Stage, Systematic review of previous studies has been applied and results of many studies indicated that new design of science integrated curriculum requires positive participation of learners during the learning process, focusing on personal and social interactions with curriculum elements, adopting clear standards for building curriculum units that reflect ideas and unity of knowledge and focus on life skills and practices, qualifying the learner for life and work, and build a Learning community based on partnership between teacher, learner and parents foundations that achieve integration can be determined as: Goals and standard, Formative assessment, Learning content, including (activities, teaching strategies, learning support resources, Active participation between the elements of the educational process (teacher, learner, and parents).

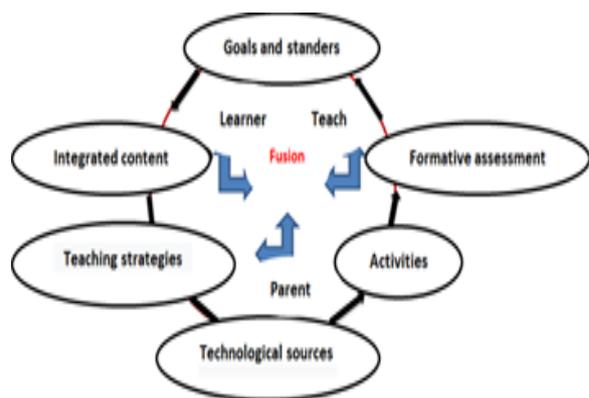


Figure (2) General foundations for achieving the vision of science integration (Walter, 2002)

To answer the second question of the research to what extent are the NGSS standards achieved within science integrated curriculum Content analysis technique applied of science integrated curriculum “discover” in the light of NGSS, **Table (1)** shows the percentage of including international standards (science - mathematics - social studies - language - arts) with the science

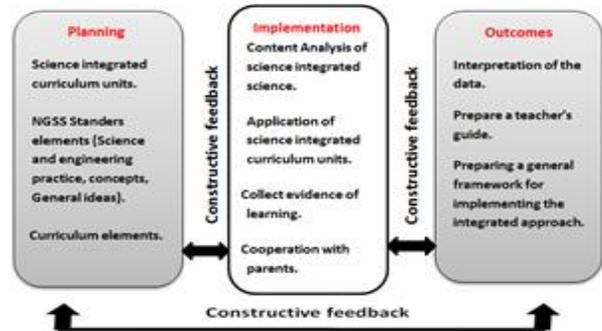
integrated curriculum for the first and second primary grades.

**Table (1) statistical significance for differences between arithmetic means of performance degrees for the study sample**

Stander percentage		
Standers	percentage of standard inclusion (first grade)	percentage of standard inclusion (second grade)
NGSS Standers	14.31%	30.71%
Mathematics standards	5.67%	5.87%
Social Studies Standards	1.49%	0.63%
Language standards		
Reading	20.66%	31.71%
writing	28.37%	3.49%
Listening and speaking	52.70%	7.70%
Art standers	1.61%	0.99

**Table (1)** shows the evident that NGSS standards and language standards are among the highest percentages compare to Mathematics, Arts, and social studies standards, and perhaps the reason for this lies in the need to empower the learner, especially in the first grades to develop free discovery skills, and this is what the title of the course "Discover" indicates. Discovery is a skill that needs practice and training, and this is what provides science integrated curriculum for first graders, also empower the learner basic language skills, reading, writing, listening and speaking, all of which are necessary skill as life skills.

To answer the third question to determine general framework for evaluating science integrated curriculum in light of the NGSS standard. Critical review of previous studies and a standards document applied, and in light of the results of content analysis of “discover” textbooks at primary stage, general framework for evaluating science integrated curriculum was followed in three stages which are (planning, implementation, outputs) illustrated in the **Figure (2)**



**Figure (3) General Framework for Evaluating Science Integrated Curriculum Units**

**Figure (3)** it becomes clear that preparing the curriculum evaluation framework includes planning for building units, determining curriculum elements and standards dimensions, then implementation and includes content analysis, gathering learning evidence and partnership with parents, and finally the outputs that include interpreting data, preparing a teacher's guide and building a general framework for evaluating curriculum in light of NGSS standards, each stage is followed by constructive feedback to identify weaknesses and make necessary adjustments

When we Notes previous presented Results, we Found the Study followed steps to prepare a proposed concept for planning the lessons of science integrated curriculum, which included:-

- Lesson plan of the theme in light of **NGSS** standards that allow the true integration of multiple fields of knowledge.
- Determine the main questions that open the way for students to brainstorm.
- Dividing the mentioned concepts into main and sub-concepts that progress in harmony according to the fields of knowledge included in each lesson.
- Creating various learning opportunities that allow students to apply knowledge in practice.

- Defining performance expectations and associated practices and performances.
- Developing cooperative skills and defining roles and responsibilities for each student to ensure the achievement of the idea of integration.
- Reviewing the sequence and sequence of the lesson plan by selecting the theme, selecting the chapter, then analyzing the content, and then preparing the lesson planning guide, including; including lesson plan.

### Discussion

In this Study, science integrated curriculum was evaluated in light of the next generation science standards. As results show standards exist in varying percentages, focusing to a large extent on NGSS and language standards comparison of math, arts, and social studies standards. And the previous studies confirmed that use content analysis techniques in light of Next generation science standards showed that availability of standards in varying percentages. This confirms the need to take into account the standards when evaluating curriculum content, especially the science integrated curricula that focus on unity of knowledge and its interdependence, The results also confirmed that merging of curriculum elements to achieve effective learning require number of elements which are goals and standard, Formative assessment, Learning content, including (activities, teaching strategies, learning support resources, Active participation between the elements of the educational process. Reconstructing the curriculum units in light of NGSS standards requires the participation of the learner through discovery and practical practice to build knowledge and ideas in an orderly manner, as well as the participation of the guardian during the learning to build an effective learning community.

### Recommendations

- The necessity of evaluating science curricula in the light of NGSS standards that based three dimensions

and these are (Scientific and engineering practices, core ideas, and general concepts) which reflects the quality of learning outcomes.

- Follow the General framework for evaluating science integrated curriculum in light of the NGSS standard that presented by the current Study.

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