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Research Article

TEACHERS' PERSPECTIVE ON INTEGRATING CAREER ORIENTATION INTO NATURAL SCIENCE EDUCATION IN HIGH SCHOOL: INSIGHTS FROM THE 2018 GENERAL EDUCATION CURRICULUM

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ABSTRACT

The 2018 general education curriculum has affirmed that career orientation is essential to upper secondary education. Science subjects (physics, chemistry, and biology) are parts of STEM education, playing a vital role in equipping students with knowledge and skills for the career fields of science, engineering, and technology. The research investigated the current teaching status and natural science teachers' views on integrating career orientation into teaching according to the 2018 general education curriculum. The results show that almost all teachers of science subjects realise that integrating career orientation in teaching is necessary for high school. However, many teachers still think it is the integration of content or knowledge. In addition, although teachers have much access to STEM education, they still need to clearly show their thoughts about integrating career orientation in STEM education in science subjects. The study also reveals that teachers need to use more role-based activities in which students should experience the role of employees. The role-based approach should be emphasised more in integrating career orientation in teaching science and STEM educational activities to achieve career-oriented competence for students.

Keywords: career orientation; science education; STEM education; teacher perception; upper secondary education

1. Introduction

According to the 2018 General Education Curriculum, career orientation consists of all school activities coordinating with families and communities to equip students with knowledge and career-oriented competence. It is implemented in all subjects and educational activities and is especially emphasised in Grades 10 to 12 (Ministry of Education and

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Training, 2018). A crucial aspect of career orientation for students is the reasonable impact of aligning their choices with practical conditions and circumstances. This is done by equipping students with the pragmatic competence necessary for the future workforce (Pham & Nguyen, 2021). Therefore, the effectiveness of career orientation in school depends partially on the cooperation of subject teachers. In the 2018 curriculum, one of the goals of the science subjects curriculum, including Physics, Chemistry, and Biology, is to contribute to developing student career-oriented competence. Therefore, career orientation in teaching sciences must be integrated throughout teaching science subjects.

In addition, the implementation of STEM education in high schools has explicitly been guided by the Official Dispatch 3089 of the Ministry of Education and Training. Accordingly, STEM education in high schools can be carried out as STEM lessons for teaching science subjects, experiential activities, and research activities (MOET, 2020). According to Shahali (2016), it is essential for young people to better understand the fields of natural science and engineering by developing appropriate programs, activities, or interventions (Shahali et al., 2016). It is valuable to design STEM activities associated with the work of actual employees to help students gradually form career awareness and foster appropriate competencies. Therefore, career orientation should be integrated into STEM education for science subjects (physics, chemistry, biology). However, according to Official Dispatch 3089, most teachers carry out STEM education separately and have yet to consider career orientation integration. Tristram Hooley and colleagues (2015) confirm that teachers should be placed at the centre of a long-term approach to student career orientation (Hooley et al., 2015). Thus, understanding teachers' perspectives toward integrated career orientation in science teaching will provide valuable information in shaping how teachers integrate career orientation through subjects. Therefore, the research focuses on clarifying the current status of education and teachers' perspectives in integrating career orientation in science subjects at high schools according to the 2018 curriculum. The results of the research contribute to appropriate orientations of the implementation of integrating career orientation in teaching science as well as in the process of implementing STEM education for natural science subjects.

2. Research methods

2.1. Sampling and participants

We surveyed high school science teachers in various provinces and cities in Vietnam, including Ho Chi Minh City, Hue, Tien Giang, Hanoi, and others. The survey was conducted online and based on the voluntary participation of teachers. The participants are all in-service teachers who are in charge of science subjects, including Biology (22.1%), Chemistry (39.6%), and Physics (38.3%). We cleaned data by removing cases in which teachers still needed to fully answer the open-ended questions or select one level for the Likert scale questions. The demographics of 149 respondents are shown in Table 1.

Table 1. *Distribution of teachers by teaching experience, teaching subject(s), and STEM education experience*

Variables	n	Percentage (%)
Teaching Subject		
Biology	33	22.1
Chemistry	59	39.6
Physics	57	38.3
Teaching Experience		
< 5 years	43	28.9
5-10 years	29	19.5
> 10 years	77	51.6
STEM Education Training Experience		
Not-yet	36	24.2
1-3 times	80	53.7
Over 3 times	33	22.1

2.2. Measurement

A questionnaire was used to record the status and perspectives of science teachers on the integration of career orientation in teaching science subjects in high schools. The questionnaire consists of some questions to collect personal information from participants, open-ended questions, and Likert scale questions to clarify teachers' perceptions and implementation of integrating career orientation in teaching science.

We analysed the reliability using Cronbach Alpha and Exploratory factor analysis (EFA) combined with the KMO index. The results showed that the Cronbach Alpha of all the factors was 0.78, so the questionnaire is good enough to use. The Kaiser-Meyer-Olkin (KMO) test was 0.806, and sig Bartlett's Test = 0.000 < 0.05, indicating that the variables are correlated.

2.3. Data analysis

The data collected was processed using a mixed-method approach, including qualitative and quantitative analysis. The qualitative analysis addressed two open-ended questions about teachers' perspectives in teaching science with integrated career orientation. We performed open coding for the teachers' open-ended responses based on the characteristics of integrated career orientation in teaching. Two researchers performed data coding and processing to ensure reliability. In addition, descriptive statistical methods were used for Likert scale questions combined with charts to analyse the perspectives and frequency of organising integrated career orientation teaching activities in natural science subjects.

3. Results and discussion

3.1. Teacher's understanding of the integration of career orientation in teaching science

The survey results showed that most teachers agreed on the importance of integrating career orientation into teaching science in the 2018 General education curriculum, as reflected by an average score of 3.4 and a standard deviation of 0.8. In addition, we used the

question "What is integrated career orientation teaching in science subjects?" to clarify teachers' understanding. According to Nguyen Van Khoi, integrated career orientation in teaching integrates *the goals, contents, and methods* of career orientation in teaching subjects, synchronously impacting learners' development to *achieve educational objectives*(Nguyen, 2019). Based on this concept, we analysed teachers' answers based on the three core *characteristics* of integrated career orientation teaching: goal, *content, and learning activity*. Specifically, integrated career orientation in teaching must ensure *(1) the goal of specific competencies combined with the goal of career orientation, (2) the content of the lesson integrates relevant career orientation content, (3) the learning activities combine contexts, career information, and social needs for students to access career orientation competence*. Answers that were not classified, unclear, or unknown were all coded into the same None group. Some examples of teacher responses and information analysis results are presented in Table 2.

Table 2. *Examples of answers about the integration of career orientation in teaching science*

Examples of teachers' answer	Goal	Content	Activity
Combining the teaching and learning of specialized knowledge with *introducing and creating careers* for students to access *and experience careers related to the subject.*		x	
Integrated career orientation in teaching science subjects is the integration of *scientific knowledge* and career orientation to *equip students with knowledge and develop career orientation competence.*	x	x	
By joining learning activities in the science topics, students *study about one or a group of specific careers related to the lesson.*		x	x
The lessons will be closely *linked to reality*, requiring students to *apply knowledge and skills related to a career* to solve problems in the lesson, thereby *forming an interest in that profession* and determining whether that profession is suitable for planning for the future.	x	x	x

The survey results, as shown in Figure 1, reflect that most teachers do not clearly understand integrated career orientation in teaching science subjects (40%). Among the remaining, most teachers believe that the integration is just in the teaching content to introduce linked careers to students. They do not mention much about the goals of career orientation competence and the integration of related careers in learning activities. In the 2018 general education curriculum, career orientation competence has three main components: understanding careers, getting career-related skill requirements, making decisions, and setting learning plans for future work. The integration needs to take into account the goal of career orientation competence to be able to design appropriate learning tasks for students.

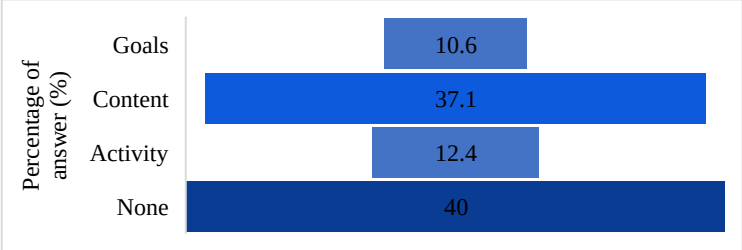

Figure 1. *Distribution of teachers' answers about integration of career orientation in teaching science*

Besides, we recorded the frequency with which teachers do several activities related to integrated career orientation through 5-point Likert scale questions, including 1 – not implemented, 2 – very rarely, 3 – sometimes, 4 – often, and 5 – consistently. The results of the mean and standard deviation of the items (Table 5) show that sharing personal experiences with students about linked careers is the most frequently performed, with an average score of 3.49. This is the most straightforward and familiar activity teachers may do. In addition, updating information about science-belonged careers and assigning tasks for students to study related careers are performed more often than integrating career-based activities. The result is consistent with the teacher's viewpoint that integrating career orientation in teaching science is just providing career information for students. This is also clearly shown by the fact that most teachers also expressed a high level of agreement that they often seek additional information about occupations in the field of science and technology and learn about student psychology to integrate into the teaching process. With the lowest mean of 2.90 among the items, the organisation of career-based learning activities is still not a concern of teachers and is not regularly performed. Therefore, it is necessary to orient appropriate activities in the classroom so that teachers can integrate career orientation in teaching science (Thai et al., 2023).

Table 3. *Means and standard deviations of activities related to career orientation integration in teaching science subjects*

Description of Activity	M	SD
Organizing *experiential activities related to careers* for students in the science teaching process	**2.90**	**0.716**
Assign students to *study careers related* to the lesson	3.10	0.771
Share personal experiences with students about careers related to the lesson	**3.50**	**0.785**
Update information for students about the achievements and development opportunities of careers in the field of science	3.33	0.817
Learn about the psychology, interests, career orientations, and career needs of students to integrate into the science lesson plan	3.31	0.853
Research interdisciplinary knowledge about careers in science, technology, and engineering to *obtain information for the science lesson plan*	3.36	0.814

3.2. Teacher's perspective of activity of integrated career orientation in teaching science

For teachers' answers to an integrated career orientation activity in teaching science, we coded responses based on the content of the learning activity described. Through discussion, we agreed to record five main activity types with descriptions and codings presented in Table 3. Unclear or unpresented responses will be counted as unknown.

Table 4. *Open coding due to teacher's answers about the activity of integrated career orientation in teaching science*

No.	Code	Open coding for the activity of integrated career orientation	Example of teachers' answer
1	INT	The teacher *introduces* career information related to the lesson	*Introduce* production processes and careers students can pursue after excelling in the subject
2	LEA	Students *learn* career information pertaining to the lesson	Students *learn about* the profession of a doctor by studying how to correct vision problems
3	PRO	Students will carry out a project to create a *product* related to the lesson (product-based project)	Students study and apply the knowledge of the ester and the process of making soap *to make soap.*
4	ROL	Students imitate the *role of employees* in carrying out a project (role-based learning)	In an activity to *make fermented fruit juice*, students *experience being factory workers* to learn and implement the process of making fermented fruit juice, and testing the quality of wine.
5	EXT	Students join *extra-curricular* activities related to careers.	When teaching the unit on cellulose, the lesson is *integrated with a field trip to a local wood* processing and manufacturing village.
6	None	Don't know, or the answer is unclear	Activities not yet implemented

Figure 2 shows the statistical analysis results of the percentage of answers about integrated career orientation activities. This suggests that most teachers are still not interested in integrating career orientation activities into teaching. The 2018 general education curriculum has been implemented for a few years, so it takes more time for teachers to pay attention to integrating career orientation in teaching. Therefore, the appropriate guidance is necessary for teachers to implement integrated career orientation in teaching science. In addition, the results also show that the activity most proposed by teachers is implementing product-based projects. Currently, most teachers have participated in STEM education training, so they recognise engineering design activity as a very close activity to occupational activities. Therefore, many teachers have mentioned organising product-creation activities for students. However, it is noteworthy that only 4 out of 149 teacher responses mentioned STEM activities. It reflects that teachers have not yet recognised that implementing STEM education in teaching is closely connected with integrating career orientation. In addition, the percentage of responses mentioning providing the experience of being a worker to complete a task of manufacturing products occupies the lowest percentage. This suggests that more attention should be paid to role-based activity for teachers when implementing integrated career orientation in teaching.

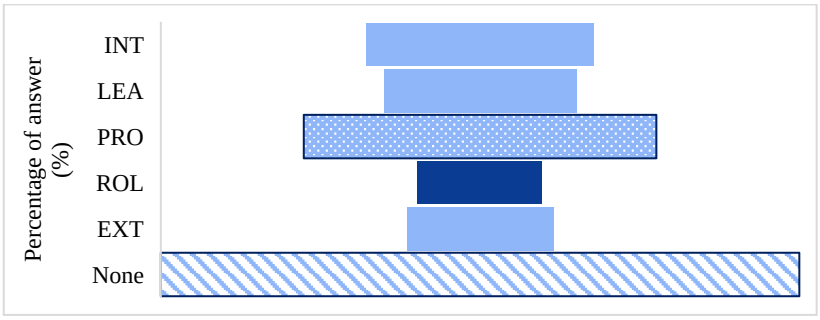

Figure 2. *Distribution of teachers' answers about the activity of integrated career orientation in teaching science*

Moreover, analyses of different subsamples regarding teaching experience and teaching subjects were performed to evaluate teachers' perspectives.

Regarding teaching subjects (biology, chemistry, and physics), Figure 3 shows that the graph patterns of the three groups are unevenly distributed among the types of activities. For biology teachers, the proportion of answers to activities for learning about career-related information is dominant, standing right after the proportion of unclear answers. In contrast, for chemistry and physics teachers, the proportion of answers to activities for implementing career-related product-based projects to career is considerably higher than for students learning about career-related information. This shows that the characteristics of subjects impact the integrated career orientation in the teaching of science teachers. This is also a key point researchers take note of as proposing strategies to implement STEM education with integrated career orientation in science subjects. Figure 3 also shows that biology teachers are more inclined towards extracurricular activities than chemistry and physics teachers. For biology teachers, this is a common form of integrating career orientation in teaching biology, for example, *"organising tree planting, field trips to production sites"* or *"organising experiential learning at the high-tech agricultural zone in Ho Chi Minh City"*.

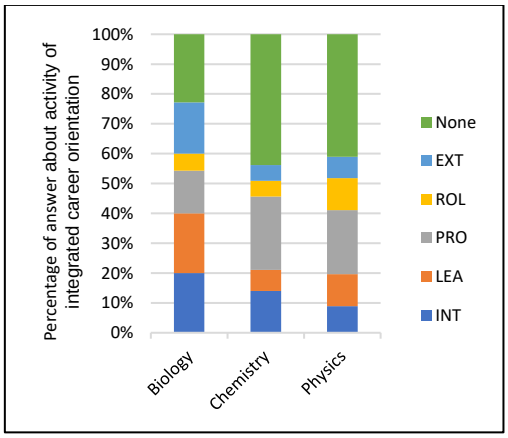

Figure 3. *Teacher's answers about the activity of integrated career orientation due to teaching subjects*

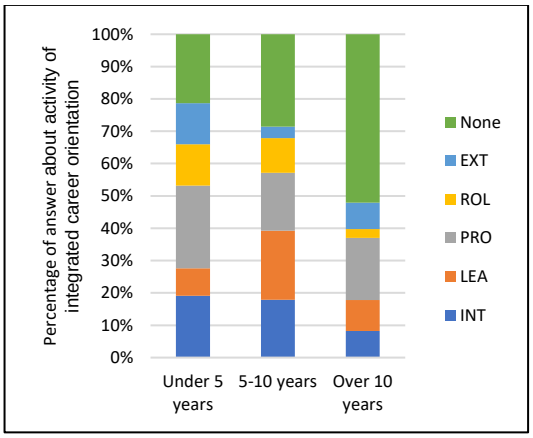

Figure 4. *Teacher's answers about the activity of integrated career orientation due to teaching experience*

Figure 4 shows the results of the analysis of responses about integrated career orientation activities in teaching science for groups of teachers with different years of experience. For teachers with 5-10 years of teaching, learning about career-related information and the product-based project occupy a comparable ratio. Meanwhile, for two teacher groups under five years and more than ten years, the proportion of the answers for career-related product-based project activities is higher than that for activities for students to learn about career-related information. Specifically, the chart pattern of teachers under five teaching years shows a relatively even distribution among five activities (Figure 4), with the product-based project showing the most significant proportion. This can be explained by the fact that STEM education in engineering design activity has become increasingly popular in high schools, providing many opportunities for teachers to access. Meanwhile, for teachers of more than ten teaching years, the answers that are not clear or unknown have the highest proportion, which shows the need to push for integrating career orientation in teaching for teachers.

3.3. Teacher's perception of the difficulty of integrated career orientation in teaching science within the school curriculum

We recorded teachers' viewpoints on the difficulties of integrating career orientation through a Likert scale with five levels from 1 - Completely disagree, 2 - Partially agree, 3 - Mostly agree, and 4 - Completely agree. The average and standard deviation results for each item are shown in Table 6. The average score for the item *"Teaching materials do not meet the specific needs of each subject and lesson."* is highest, indicating that it is the biggest concern for teachers. In addition, teachers feel unclear about the implementation methods and still need to obtain suitable integrated content to implement. Therefore, research on integrated career orientation in science teaching is necessary. Especially with promoting STEM education in the curriculum, the need for research on integrating career orientation in STEM lessons to teach science subjects is convenient. Moreover, the opinion that “the amount of science knowledge and career-oriented education is too much for students” has the lowest average score of 2.54, indicating that most teachers feel that integrating career orientation into science subjects may be within an acceptable limit and feasible in schools.

Table 5. *Means, standard deviations of each difficulty in integrated career orientation in teaching science*

Description of Difficulty	M	SD
The class time is not enough	2.81	0.949
The school's facilities do not meet the requirements well	2.76	1.004
Teaching materials do not meet the specific needs of each subject and lesson	3.03	0.834
Teaching methods are not straightforward and do not support integration	2.79	0.848
The integration of career orientation does not meet the requirements for evaluation	2.73	0.913
Schools and localities do not provide many opportunities for the integration of career orientation	2.89	0.858
The amount of information and knowledge is too much for students	2.54	0.927

4. Conclusion

This study presents teachers' perspectives on integrating career orientation into science subjects. Many teachers still need to clearly express their understanding of career orientation-based activities to contribute to achieving the career competence goals in the 2018 General education curriculum. In addition, most teachers, especially young teachers, clearly recognise the product-based activity as suitable for integrating career orientation in teaching science. However, the element of experience in the role of a worker (role-based activity) has yet to be emphasised in integrating career orientation in teaching and STEM education activities to achieve the goal of career orientation for students. The study results provide relevant information about the topic's current status and propose appropriate strategies for teachers to implement integrated career orientation in teaching science subjects, especially STEM-based learning in schools.

❖ ***Conflict of Interest:*** *Authors have no conflict of interest to declare.*

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QUAN ĐIỂM CỦA GIÁO VIÊN ĐỐI VỚI DẠY HỌC TÍCH HỢP GIÁO DỤC ĐỊNH HƯỚNG NGHỀ NGHIỆP TRONG DẠY HỌC CÁC MÔN KHOA HỌC Ở TRƯỜNG TRUNG HỌC PHỔ THÔNG THEO CHƯƠNG TRÌNH 2018

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ABSTRACT

Chương trình giáo dục phổ thông 2018 đã khẳng định giáo dục hướng nghiệp là một phần quan trọng cần nhấn mạnh trong giai đoạn trung học phổ thông. Các môn học khoa học (Vật lí, Hoá học và Sinh học) là một bộ phận của giáo dục STEM, đóng một vai trò quan trọng trong việc định hướng các nghề nghiệp thuộc lĩnh vực khoa học kĩ thuật và công nghệ. Nghiên cứu tập trung khảo sát thực trạng dạy học và quan điểm của giáo viên các môn khoa học trong tích hợp giáo dục hướng nghiệp trong dạy học tại các trường trung học phổ thông theo Chương trình giáo dục phổ thông 2018. Kết quả nghiên cứu cho thấy giáo viên các môn khoa học hầu như đều nhận thấy tích hợp giáo dục hướng nghiệp là cần thiết, song quan điểm tiếp cận tập trung nhiều về tích hợp nội dung hướng nghiệp. Bên cạnh đó, giáo viên tuy tiếp cận nhiều với giáo dục STEM nhưng quan điểm thực hiện giáo dục STEM tích hợp giáo dục hướng nghiệp để học sinh nhận thức rõ hơn về các ngành nghề khoa học, kĩ thuật và công nghệ vẫn được thể hiện rõ. Yếu tố trải nghiệm trong vai trò của người lao động chưa được nhấn mạnh hơn trong quá trình tích hợp giáo dục hướng nghiệp trong dạy học cũng như trong các hoạt động giáo dục STEM để có thể đạt được mục tiêu định hướng nghề nghiệp đối với học sinh.

Keywords: định hướng nghề nghiệp; giáo dục khoa học; giáo dục STEM; nhận thức của giáo viên; dạy học tích hợp