

INSTRUCTIONAL PRACTICES OF HIGH SCHOOL PHYSICS TEACHERS

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PURPOSE

- gather feedback from physics teachers in Berks, Lehigh, and Schuylkill counties in Pennsylvania to ascertain their instructional practices
- compare results to extant research
- inform the researcher's preparation and instruction as a future physics teacher

MAIN THEMES FROM THE REVIEW OF LITERATURE

- There are several different approaches to teaching physics.
- One pedagogical theme is called constructivism, which is “the idea that students must build their own understanding ...” (Morgan & Kittleson, 2012, p. 4).
- Methods of instruction that align with constructivism can contrast methods that focus on the teacher, such as lecture (Morgan & Kittleson, 2012).

MAIN THEMES FROM THE REVIEW OF LITERATURE (CONT.)

- Studies by Ülen and Gerlič (2012) and Bigozzi, Tarchi, Fiorentini, Falsini, and Stefanelli (2018) demonstrate the positive outcomes of teaching for conceptual learning and teaching with a constructivist approach, respectively.
 - Ülen and Gerlič (2012) found that the group taught for conceptual learning had better end results in higher-order thinking areas than did the group taught with the traditional method.
 - Bigozzi et al. (2018) found that those instructed in the constructivist manner performed better in terms of conceptual understanding than did those taught with a focus on the content. The two groups did not differ in their “post-test science-related beliefs or critical thinking” (p. 11).

METHODOLOGY: PARTICIPANTS

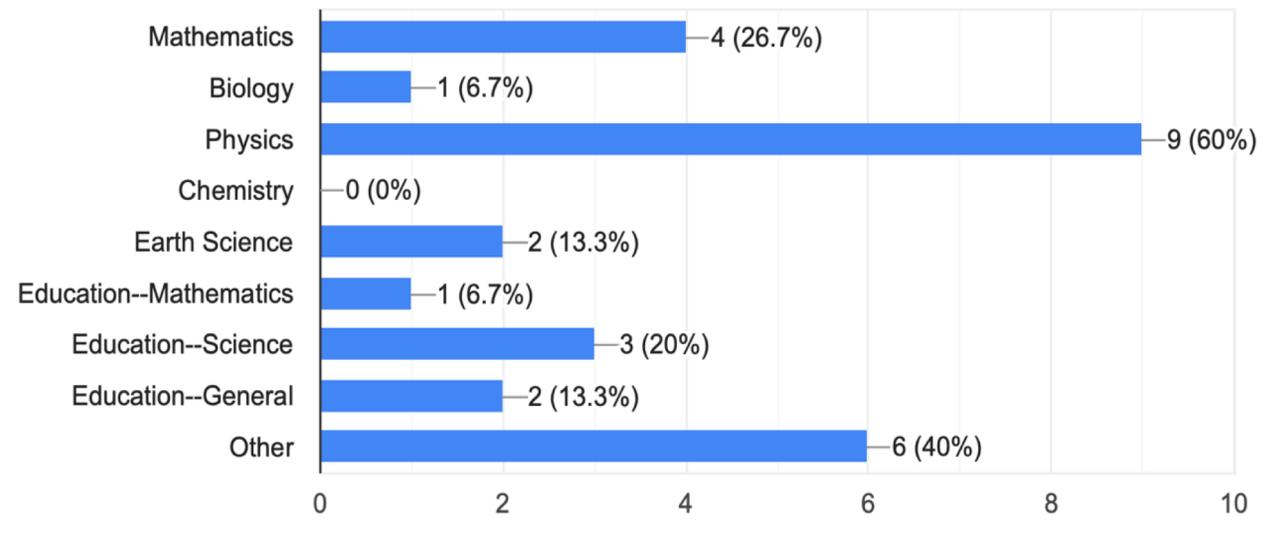
- Participants consisted of physics teachers from one of three Pennsylvania counties (Berks, Lehigh, and Schuylkill).
- To get the questionnaire to prospective participants, the researcher comprised a list of the names and email addresses of principals (or those in a similar position) working in schools in these three counties.
 - School and contact information were obtained by visiting various websites, such as county intermediate unit, school district, and school review websites.
 - Those on the list were emailed on December 11, 2019 and asked to forward the attached informed consent document containing the link to the questionnaire to the physics teachers in their school.
 - It was requested that the survey be completed by December 20, 2019.

METHODOLOGY: INSTRUMENT

- The questionnaire was adapted from the Grade 8 Teacher Questionnaire (Science) from *Trends in International Mathematics and Science Study 2015* (TIMSS, 2015).
- Items were selected for inclusion in the present questionnaire based on their relevance to the purpose of this study.
- Google Forms was used in this study.
- Fifteen participants completed the questionnaire.

MAJOR FINDINGS: TEACHING EXPERIENCE & BACKGROUND

- Twelve of the 15 participants had ten or more years of teaching experience.
- Only nine of the 15 participants had physics as a major or main area of study during their post-secondary education.



Participants' major or main area(s) of study during their post-secondary education. Participants could select as many as apply.

MAJOR FINDINGS: TEACHER INTERACTIONS

- A slight majority of the teachers reported that they often share what they have learned about their teaching experiences with their colleagues.
- Discussing how to teach a particular topic, visiting another classroom to learn more about teaching, and collaborating were not as common.

MAJOR FINDINGS: TEACHER NEEDS

- A large majority of the participants felt that they needed more time to:
 - prepare for class
 - help individual students
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- Without proper time for these areas, instruction may not promote maximum student learning and may be comprised of activities that do not require much preparation.

MAJOR FINDINGS: FREQUENT INSTRUCTIONAL ACTIVITIES

- Several can be related to constructivist instruction:
 - relating the lesson to students' daily lives
 - asking students to explain their answers
 - encouraging classroom discussions among students
 - encouraging them to express their ideas in class
- Asking students to decide their own problem-solving procedures was not as frequent, but is connected to constructivist techniques as well.

MAJOR FINDINGS: TEACHER CONFIDENCE

- Participants were asked to rate their confidence in doing different tasks.
- Several tasks can be related to constructivist learning, such as:
 - explaining science concepts or principles by doing experiments
 - developing the higher-order thinking skills of students
 - teaching science using inquiry methods
- For these three areas, a large majority, if not all, of the teachers rated their confidence as high or very high.

MAJOR FINDINGS: STUDENT TASKS

- Participants were asked to rate how often they ask their students to do certain tasks.
 - Using scientific formulas and laws to solve routine problems appeared to be the most common.
 - Seven participants indicated that they never have students memorize facts and principles.
 - Though with varying extent, all of the participants indicated that they have students:
 - listen to the teacher explain new science content
 - observe natural phenomena and describe what they see
 - conduct experiments or investigations

MAJOR FINDINGS: TECHNOLOGY

- All but one of the participants indicated that students do have access to computers or tablets during lessons.
 - This does not, however, give insight into the frequency in which the technology is used.
- Six participants participated in professional development related to integrating information technology into science in the preceding two years.

MAJOR FINDINGS: PROFESSIONAL DEVELOPMENT

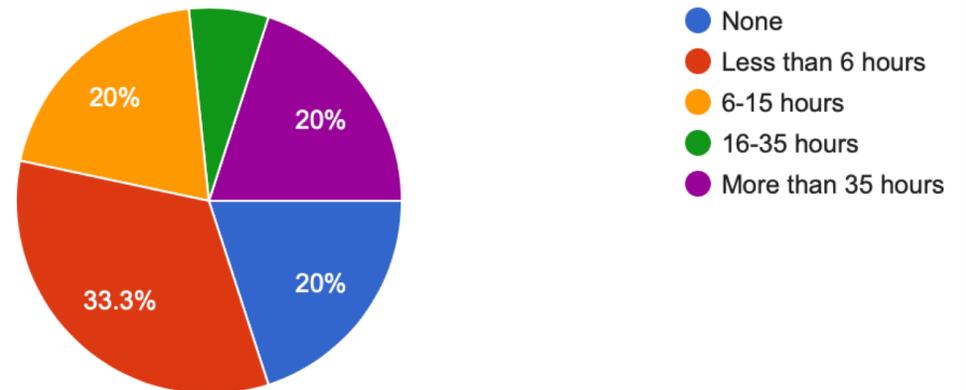
- Only two of the teachers participated in professional development related to science pedagogy/instruction in the preceding two years.
- More participated in professional development related to general pedagogical areas, such as improving students' critical thinking or inquiry skills and addressing individual students' needs.

MAJOR FINDINGS: PROFESSIONAL DEVELOPMENT (CONT.)

- The total amount of hours the participants spent in formal in-service/professional development for science in the last two years varied greatly.

13. In the past two years, how many hours in total have you spent in formal in-service/professional development (e.g., workshops, seminars, etc.) for science?

15 responses



CONCLUSION

- A variety of instructional techniques are implemented in classrooms.
- The scope of the study was relatively limited.
- This study is a pilot study that needs further research.
- Future studies in this field could include a more extensive scope and involve elements other than or in addition to a questionnaire.
- Given the individualized nature of education and student characteristics and needs, one must be careful not to generalize findings in such a way that could weaken or harm the effectiveness of instruction.

RECOMMENDATIONS

- Evaluate realistic ways to allot more time for teachers to prepare for class and address the needs of individual students.
- The disparity in professional development should also be addressed.

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