

FUTURE CHEMISTRY TEACHER'S PERCEPTIONS OF VOCATIONALLY RELEVANT LEARNING ACTIVITIES

Objective of this research is to study what kind of learning activities have high vocational relevance in pre-service chemistry teacher education. This research objective is approached by studying future chemistry teacher's perceptions of different learning activities that are offered in chemistry education courses during their bachelor and master's studies. Research was carried out as a case study utilizing mixed methods approach. Data was collected via online questionnaire. Total number of respondents was 59. According this research, discussions and laboratory activities were most vocationally relevant. Writing exercises were least relevant. The level of experienced relevance was mostly internal (skills and knowledge for career) and it had both present and future focus. These results can be used for developing vocationally high relevance learning activities for pre-service chemistry teacher education.

Keywords: learning activity, pre-service chemistry teacher education, relevance

INTRODUCTION

The term “relevance” is often mentioned as a goal for developing educational programs, courses, instructional materials etc. Depending on the definition, relevance has been used e.g. as a synonym for interest, describing student's perception of meaningfulness or their learning needs or a mixture of all these. (Stuckey, Hofstein, Mamlok-Naaman, & Eilks, 2013) In 2013, Stuckey et al. published a broad literature review of how “relevance” has been used in education. Based on their review they formed a comprehensive definition for relevance that summarizes central ideas from earlier literature. In Stuckey's et al. definition the meaning of relevance is modelled through different dimensions (personal, societal and vocational) and the relevance may be experienced as internal or external in present moment or future. (Stuckey et al., 2013)

In this research we focused studying the vocational relevance of learning activities in pre-service chemistry teacher education courses. Stuckey et al. (2013) define the vocational dimension as positive consequences that offer orientation for future vocation. The goal is to understand future chemistry teacher's perceptions of different kind of learning activities relevance that enable developing pre-service chemistry teacher education to make more sense for student's and thus support learning (Hugerat, Mamlok-Naaman, Eilks, & Hofstein, 2015). The study was carried through following research questions: RQ1: What kind of learning activities do future chemistry teachers consider most relevant or irrelevant for their learning and future career? RQ2: What kind of arguments do they present for relevant and irrelevant activities?

METHODS

This research was carried out as a case study utilizing mixed method approach (Cohen, Manion, & Morrison, 2007). Data was gathered via online questionnaire between January 2017 and December 2018. All together 59 future chemistry teachers answered in the questionnaire. Questionnaire included 15 questions divided in five sections. In this research we only use data from questions 5–7. Question five was a five item Likert-scale (1 completely meaningless – 2 somewhat meaningless – 3 neutral option – 4 somewhat meaningful – 5 very meaningful) that probed perceptions of different learning activities used in the chemistry teacher education courses (see Table 1). Question 6 was open where respondents were asked to write justification for the most relevant or meaningful activity and question 7 was the same for the most irrelevant or meaningless.

The most relevant and irrelevant activities (RQ1) were analyzed via descriptive statistics (frequencies, mean, standard error and median). Statistical phase was used for selecting three most relevant or irrelevant activities. Data from the open questions was used for describing the arguments that future chemistry teachers presented for the most relevant or irrelevant activities (RQ2).

RESULTS

Future chemistry teacher experienced learning discussions (mean 4,57) and laboratory related activities (mean 4,20-4,57) as the most relevant for vocational development. Also, traditional exercises (mean 4,22) and lecture (mean 4,19) were reported highly relevant. Writing assignments like learning diaries (mean=3,48), summaries and short essays (mean 3,54) and drama activities (mean 3,44) were experienced little less relevant. Writing a blog text about one learning was experienced partly irrelevant (mean 2,45) (see Table 1).

Table 1. Learning activities organized from relevant to irrelevant.

| Learning activity | Category | 1 | 2 | 3 | 4 | 5 | Mean | SE | Median | Resp. rate |
|--------------------------------------|----------------------|---|----|----|----|----|------|------|--------|------------|
| Designing laboratory activities | Laboratory | 0 | 0 | 6 | 12 | 38 | 4,57 | 0,09 | 5 | 95 % |
| Discussions | Collaboration | 0 | 2 | 3 | 24 | 30 | 4,39 | 0,10 | 5 | 100 % |
| Inquiry-based open activities | Laboratory | 0 | 1 | 5 | 25 | 22 | 4,28 | 0,10 | 4 | 90 % |
| Shorter closed laboratory activities | Laboratory | 0 | 3 | 5 | 17 | 20 | 4,20 | 0,13 | 4 | 76 % |
| Chemistry exercises | Exercise and lecture | 1 | 2 | 0 | 11 | 13 | 4,22 | 0,20 | 4 | 46 % |
| Lectures | Exercise and lecture | 0 | 2 | 6 | 28 | 21 | 4,19 | 0,10 | 4 | 97 % |
| Project working | Collaboration | 1 | 2 | 6 | 29 | 15 | 4,04 | 0,12 | 4 | 90 % |
| Meeting chemistry researchers | Collaboration | 0 | 4 | 7 | 16 | 10 | 3,86 | 0,16 | 4 | 63 % |
| Summaries and short essays | Writing | 1 | 5 | 8 | 19 | 4 | 3,54 | 0,16 | 4 | 63 % |
| Roleplay and drama exercises | Exercise and lecture | 0 | 6 | 11 | 16 | 3 | 3,44 | 0,15 | 4 | 61 % |
| Learning diary | Writing | 2 | 8 | 6 | 23 | 5 | 3,48 | 0,16 | 4 | 75 % |
| Blog texts | Writing | 1 | 12 | 4 | 3 | 0 | 2,45 | 0,18 | 2 | 34 % |

Discussions are carried out in small groups, pairs or with the whole class. Some of them are done in class and some online. Future chemistry teachers experienced discussions as one of the most relevant learning activities. They felt that sharing own ideas, and hearing other's thoughts forced to think and argument. Collaboration with peers enabled creating new ways to see things. Online discussions reported meaningless if instruction was experienced unclear.

- *"Discussions, if it stayed in topic, forced to think and argument."* (R3)
- *"Discussions with peers expanded my thoughts about teacher's vocation."* (R10)
- *"In discussions I got feedback from my own thoughts and heard different opinions. I feel that discussions expanded my thinking."* (R13)
- *"Online discussions were poorly instructed, and I didn't get much out of them."* (R39)

Laboratory work were seen vital in chemistry teacher education. Designing new laboratory activities was experienced especially relevant because respondents felt that it has a major role in chemistry teacher's daily work, and it enabled thinking about pupils needs. It was also experienced supporting own learning. On the other hand, e.g. open inquiry-based were experienced difficult if the result is not clear and in general laboratory work has to integrated into some meaningful theme.

- *"Designing new laboratory activities has a major role in chemistry teacher's work. Even the new curriculum guides into this direction."* (R6)

- “*Designing laboratory activity enabled studying the content more carefully.*” (R23)
- “*Designing laboratory activity enabled thinking what pupils should think.*” (R24)
- “*Inquiry-based laboratory activities doesn't always provide meaningful results.*” (R1)
- “*Laboratory work was a bit separate section. It could have been integrated inside some other theme.*” (R48)

Writing assignments were experienced most useless. Some felt that they already know how to write a particular type of text, some felt learning diaries and blog texts unclear or not suitable for supporting learning or teaching.

- “*Learning diary is an unclear idea.*” (R32)
- “*I feel that learning diaries are totally useless. They only add stress.*” (34)
- “*I don't see any use for blogs in teaching or learning.*” (R12)
- “*Sometimes reflections are written for the teacher not for yourself. That's why they are not meaningful for supporting learning. Even though writing is a good way to learn.*” (R11)
- “*Blog writing is a personal way to express oneself so should be optional.*” (R4)
- “*I can't evaluate my learning through writing assignments.*” (R50)
- “*I am already familiar in writing summaries.*” (R2)

DISCUSSION

The most relevant learning activities experienced by the future chemistry teachers were discussions and different kind of laboratory activities. Especially designing new laboratory work was seen relevant in multiple ways, e.g. essential role in chemistry teacher's work or efficient method to learn self and support pupils learning. Discussions enabled collaboration and learning from peers. Writing activities in general were seen less relevant than other type of activities. Analyzing these results from the Stuckey's et al. (2013) model's point of view, the vocational relevance related to learning activities was mainly internal (skills and knowledge for career) and focused partly in the present learning needs and partly towards future career orientation. These results can be used for developing learning activities for pre-service chemistry teacher education with high vocational relevance.

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