Students' scientific knowledge and skills as a prerequisite for studying health care at the tertiary level – the Tartu Health College case

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Summary

Introduction

In the 21st century it is seen as an expectation that all educated students possess a combination of abilities, capabilities and personal features, together expressed as Scientific Literacy (SL) (Choi et al., 2011; Holbrook & Rannikmäe, 2009; OECD, 2013). This suggests that secondary school studies need to focus on developing SL, rather than focus solely on scientific content (Holbrook, 2010) and is clearly stated in the Estonian National Curriculum for Secondary Education (Gümnaasiumi riiklik õppekava, 2014). In Estonia, these qualities very much align with tertiary level healthcare education curricula expectations (Tartu Tervishoiu Kõrgkool, 2014a-f), indicating that SL has a wider focus than supporting a narrow science orientated career.

Tertiary level health programmes recognise the need to promote Health Literacy (HL). This has been defined in multiple ways. Parker (2009), states that HL is 'the ability of individuals to obtain, understand and use health information to make health decisions.' Nutbeam (2000) divided HL into three sub-categories: functional HL, communicative HL and critical HL. WHO (2013) suggests that HL issues should be addressed at all levels of education, including school education and also in lifelong education. However, these HL definitions relate to information processing skills, rather than an overall awareness of societal, personal and cognitive aspects of health, and when contrasting with SL are insufficient to be the sole educational outcome in healthcare education. In fact, it seems that proposing the definition of SL as incorporating HL can be meaningfully argued.

A widely known school problem is that students have difficulties studying science subjects and obtaining SL skills (Potvin & Hasni, 2014; Rannikmäe et al., 2014; Soobard & Rannikmäe, 2015). Teichmann & Kübarsepp (2008)

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showed that even students who opt for studies in the science and technology field have weak conceptualisation in science and lack psychosocial skills. Therefore, a similar situation is to be expected among students who choose to continue education at the tertiary level in healthcare. Furthermore, if students have weak SL skills, this can be expected to lead to many additional problems, such as:

- choosing the wrong profession due to an unawareness of its requirements;
- lack of motivation;
- ineffective use of time and resources in college;
- inability to make sufficient academic progress, and
- eventual dropout.

This can also be seen in Tartu Health Care College as during 2013 and 2015, an unsuitable curriculum and academic difficulties were two major reasons cited for dropout (Tartu Tervishoiu Kõrgkool, 2014a, 2016). At the national level, such dropout can lead to a lack of competent professionals in the health care field.

The research goal is put forward as: to determine 1st year healthcare students' scientific knowledge and skills, which are prerequisites for studying tertiary level health care, measured in terms of scientific literacy and health literacy (as possible goals for health education).

The research questions are put forward as:

- What is the level of some components of 1st year healthcare students' SL, measured in terms of health literacy?
- Which skills are developed better and which are not and are they sufficient to carry out studies in tertiary level health care?
- How do factors like the years passed since gymnasium graduation, previous education and intent to study further after graduation, affect the results?

Methodology

Sample

The participants were 1st year students of Tartu Health Care College (n=213). 79% of the participants had a gymnasium certificate, 19% had already undertaken higher education courses, 2% had a Master's degree and one (0.5%) held a PhD qualification. Most respondents (49%) graduated from gymnasium in the same year as attending the college, 36% 1–5 years prior to attending; 6% 6–10 years, 5% 11–20 years and 2.5% over 21 years before starting the college course. About half of the respondents (51%), planned to undertake further study after graduation.

The Instrument

The instrument, originally composed and validated by Soobard & Rannikmäe (2015), was modified according to the research questions and specific needs of the current study.

The format of the instrument was real-life scenarios, based on which scenario-related questions were asked and it was seen as easily adaptable to the context of healthcare. Modified items included mainly background information.

The instrument items were constructed based on SL skills related to background knowledge and skills, problem solving, decision making with socio-scientific reasoning and social responsibility. Each of the items also related to functional, communicative and critical levels associated with HL.

Findings and discussion

Principal component analysis divided the item responses into 4 components. The groups were as follows:

Component 1 (6 items) relates to skills that require research ability, problem solving, divergent thinking and socio-scientific reasoning skills. In terms of HL levels, the items cover communicative and critical levels. The common denominator for the group can be described as practical components associated with SL.

Component 2 (4 items) includes items that require decision making, with explanation and/or socio-scientific reasoning. In terms of HL, this group includes functional and communicative levels. A common feature here is the scientific knowledge component of SL (scientific knowledge and explanation).

Component 3 (3 items) involves decision making that requires more complex and specific background knowledge, problem solving, data interpretation and socio-scientific reasoning and all three items relate to communicative HL. The common denominator is communication

Component 4 has two items and both require knowledge application and are at a functional HL level. The common denominator here is knowledge application.

None of the items were found to be purely one or another skill or level, as all items were complex. If these component groups were put side by side with the summary outcomes of all the higher education level curricula in Tartu Health Care College, they would incorporate virtually all expected outcomes to be achieved by all graduates. Mean results by components is given in Table 1.

Table 1. Mean results by components (Scores: 2-correct answer; 1-partially correct; 0-wrong or missing answer)

Component	Answers by scores (%)			Mean	*SE*	*SD*	Variance
	0	1	2				
1	40.5	31.5	28.0	0.88*	.04	.54	.29
2	38.5	21.1	40.4	1.02*	.04	.54	.29
3	61.2	16.6	22.2	0.06*	.04	.61	.37
4	22.3	27.2	50.5	1.28**	.04	.55	.31
All items				0.91	.03	.41	.16
Summary score (all the items)				13.79	.42	6.07	36.79

* Statistically significantly lower than average (*t*-test, $p<.05$)
** Statistically significantly higher than average (*t*-test, $p<.05$)

The mean results of the components are given in Table 1. It can be seen from the results that component no 4 gives the highest mean score, which involves knowledge application and the lowest is by the group in component 3, which involves several skills as well as the need to communicate the results. Component 4 includes a few of the most basic outcomes (such as "Have sufficient knowledge, understanding and skills in the field of the curricula") within the Tartu Health Care College curriculum. However, most outcomes (such as "able to implement assessment, analysing, problem solving and decision making skills in independent or team work" or "evaluate critically the results of the work and take responsibility for their actions") are covered by Component 3 which unfortunately had more than 61% of wrong or missing answers. On the basis of these results, it can be said that students are expected to obtain most curriculum outcomes during the studies, without much basis to build on, and that it is putting more stress and workload on school and students.

It was found that previous education level correlated weakly, but statistically significantly, with test scores (Spearman correlation $\rho=0.24$; $p<0.001$). The time passed since gymnasium studies also had an influence on the results ($\chi^2=811.30$, $p<0.001$), but interestingly, the group with students who had more than 21 years post gymnasium experience, scored higher than others (probably because of the education level). The intent to study further had a small positive, but significant effect on the test scores (*t*-test, $p<0.05$). That could be explained by making reference to motivation and self-efficacy, which, according to Artino et al. (2012) and Raved & Assaraf (2011), greatly influenced academic success in healthcare education.

Conclusions

1. Gymnasium graduates' overall ability level in SL components is not very high and that can be expected to lead to problems within health care studies.
2. Only the lowest level items, which required knowledge application skills, are well answered (within component 4).
3. The weakest SL areas for respondents are communicative skills at the higher level and practical SL skills that are required to study effectively in tertiary level health education. It is clear that these need more development.
4. The results are influenced by previous education levels, attitudes toward gymnasium biology and chemistry classes, the time passed since gymnasium studies and the intention to study further.

It is suggested that the college itself can address these issues by introducing appropriate courses that focus on raising SL and its personal components (motivation, self-efficacy).

Keywords: scientific literacy, health literacy, health education