

How pupils differ related to the breadth of interests

Radek KRÍČEK

Astronomical Institute of the Charles University, V Holešovičkách 2, 18000, Prague, Czech Republic

Abstract. The goal of our research was to assess the role of astronomy education in scientific career choice and to compare its influence to the influence of other variables if possible. We found out that many studied effects were in fact related to the breadth of pupils' interests. This contribution will describe the research design and the problems for which is this phenomenon important: perceived attitude of close people towards participation in non-formal education, long-term persistence in activities, motivation for long-term persistence, motivation sources and sources of feedback. Several possible practical implications will be discussed.

1 Theoretical framework

Sometimes, we can hear about the important role of astronomy topics in science education. Children claim that they would like to learn about problems related to space [1]. However, we are not sure if this interest is supported by real learning experience or rather by the lack of it [2]. By increasing interest in physics or science lessons, astronomy could help in the search for new workers educated in science. So far, it has not been systematically examined whether such effect can be seen. Another unexplored field is the impact of non-formal astronomy education on pupils' attitude to science career. This led us to formulate the basic research questions: Does astronomy education help in recruiting young scientists? Or is there another variable related to science education with greater influence? Based on our previous qualitative research, we decided to focus on several specific topics. Long-time persistence in scientific activities and the types and sources of motivation for the persistence were in our focus as well as the sources of feedback, perceived attitude of close people and other variables.

The role of these topics in career choice process can be described by the models of Social Cognitive Career Theory (SCCT) [3]. It consists of three phases called Career Interest, Choice and Performance. The model for each phase has certain repeating features: self-efficacy and outcome expectations lead through interest to actions. The performance outcomes from these actions influence sources of self-efficacy and outcome expectations again. How astronomy education fits into this scheme depends on a specific process we are trying to describe. For example, widespread non-formal astronomy education could contribute to building self-efficacy through the outcomes of activities.

One alternative way to explain the studied phenomena is considering the breadth of interests. The importance of distinguishing between the intensity and the breadth of interests was described recently [4]. Perhaps the career choice could be also influenced by the breadth of interests of a person rather than the influence of one specific field of science, like astronomy, even if the interest is intense.

2 Methods

The initial exploratory phase of the research consisted of semi-structured interviews. People related to astronomy education (participants, researchers) were interviewed. Based on the results, we specified our research questions into subquestions such as: "To which extent does astronomy education allow to create self-efficacy to its participants? Is there a difference in persistence in astronomical and non-astronomical activities?" and others. Consequently, we created a questionnaire for students entering universities. Such students can answer questions

about their recent career choice and about interest, retrospectively. The questionnaire was distributed to six Czech universities in an online form. The participation was voluntary. In total, 292 students filled and sent their answers. After obtaining data, we evaluated validity and reliability and used statistical tools with a special emphasis to variables related to astronomy education influence and to the breadth of interests.

3 Results

The data allowed us to identify specific topics with differences among respondents. We compared groups of people sorted by two main criteria: the perceived importance of astronomy education in their career choice and the breadth of interests. As we found out, the breadth of interests led to bigger differences between groups. Thus, it is rather the breadth of interests what is driving the career choice process. However, this does not mean that the supposed potential of astronomy to stimulate the science career interest was overestimated. It should be a goal of future research to clarify if and how we can use astronomy as a useful topic in education while keeping in mind the advantages of building broad interests.

The specific topics in which the breadth of interests was related to significant differences among respondents were: perceived attitude of close people towards participation in non-formal education, long-term persistence in activities and motivation, motivation sources and sources of feedback. The group with higher breadth of interests showed more positive perception of the attitude of close people, generally higher motivation, more feedback in non-formal education and more negative feedback at school. The reason should be a subject of further research. Notably, broader interests also mean higher persistence in activities. Therefore, it seems that people with more interests also tend to pursue them more systematically. We also found a difference among people with low and high breadth of interests in their experience with astronomy at school. Astronomy education was more frequent in the case of people with high breadth of interests. This could mean that higher content variability in school lessons influences the breadth of interests.

4 Conclusion

We designed our research to determine how formal and non-formal astronomy education can influence the career choice. For this reason we performed interviews with people related to astronomy education and created a questionnaire for entering university students. Thanks to its generality we found out that the breadth of interests has bigger influence on evaluated topics than astronomy education. We showed that pupils with broader interests tend to participate in activities regularly more often, are generally more motivated and perceive more positive attitude of close people. The potential of astronomy education in motivating children towards science education as one part of creating broad interests should be a subject of further research.

References

- [1] J. Lavonen, R. Byman, K. Juuti, V. Meisalo and A. Uitto, Pupil Interest in Physics: A Survey in Finland, *Nordic Studies in Science Education* **1** (2005) 72-85.
- [2] M. Kekule and V. Žák, Mají dívky a chlapci rozdílné postoje k fyzice a zájem o ni? Co s tím? *Pedagogická orientace* **3**, 65-88.
- [3] R. W. Lent, S. D. Brown and G. Hackett (2002). Social Cognitive Career Theory. In D. Brown and associates (Ed.), *Career Choice and Development* (pp. 255-311). San Francisco: Jossey-Bass.
- [4] M. Bathgate and C. Schunn, Disentangling Intensity from Breadth of Science Interest: What predicts learning behaviors? *Instructional Science* **44** (2016) 423-440.