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Evidence-based Practices at a Super Science High School in Japan

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Abstract: This poster presents some of the evidence-based practices at Kumamoto Prefectural Kumamoto Kita High School, a designated super science high school in Kumamoto, Japan. The school's SSH curriculum is structured around three core principles: Research (R), Leadership (L), and Co-Creation (C). This paper focuses on practices employed within the L category, primarily experiential learning and authentic assessment. Student perceptions of the program's activities and curriculum are routinely collected to track the development of student attitudes and abilities.

Keywords: SSH, Inquiry-based learning, Authentic Assessment, Evaluation

1. Introduction

The Super Science High School (SSH) initiative, as designated by the Ministry of Education, Culture, Sports, Science, and Technology (MEXT), is defined as "an effort to cultivate students' scientific inquiry skills through advanced science, technology, and mathematics education, thereby fostering science and technology professionals who will lead future society" (Japan Science and Technology Agency). As of 2024, there are 225 designated SSH schools. This includes our school, Kumamoto Prefectural Kumamoto Kita High School, which is currently in phase three of development, defined as "establishing initiatives that deepen and sustain school strengths and characteristics that have impact both within and outside the region" (JST). Our school's phase three objective is "Development and dissemination of an educational curriculum for cultivating globally and scientifically minded leaders with a collaborative perspective". The three main pillars are Research (R), Leadership (L), and Co-creation (C). The L category specifically focuses on international awareness and independent research. Specialized classes such as Data Science (DS) and Global Standard Science (GSS), as well as the Kumamoto Kita Student International Science Forum (KSISF), are designed to develop students' attitudes and abilities regarding global awareness and the scientific process.

2. SSH Curriculum at Kumamoto Kita High School

2.1 *Learning Activities*

As our school is the only high school in Kumamoto prefecture with a designated English course, international exchange and fostering a global perspective are established as core tenets. Exchanges are supported by partnerships with universities and international schools and serve as authentic learning opportunities, where students perform tasks that mimic or are based in real-life settings (National Research Council, 2001). The final step of students' independent research is to create and present a poster in English. Selected teams then present to an audience of international judges and students at KSISF as an authentic assessment of their understanding.

To facilitate this process, the GSS class uses inquiry-style instruction to develop student understanding of scientific processes in English and their science communication skills. Experiential learning, such as fieldwork, experiments, and project-based learning, is

employed to ensure that students can communicate their understanding in multiple forms. In the DS class, students learn the foundations of information communication, analysis, and digital literacy. Projects include researching topics such as the efficiency of power generation sources in Kumamoto to create videos and infographics for the local community.

2.2 *Assessment of Learning*

Development of student abilities and attitudes by the SSH curriculum is primarily evaluated through rubrics and surveys. Students complete self-evaluations using the SSH rubric and a career awareness survey twice a year, while surveys are employed for individual projects. Figure 1 shows a portion of the 2024 KSISF survey asking students to rank their agreement with the statement “If I make an effort, I can do it” regarding future English endeavors.

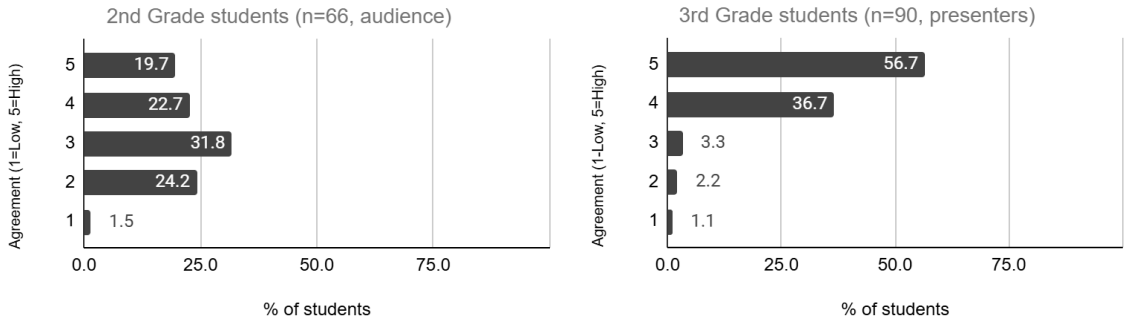

Figure 1. Student responses to the question “After participating in KSISF, regarding future collaborative and English learning and presentations, do you think if you make an effort you can do it?” (5 point scale).

The survey results revealed a noticeable difference in student perception of their own abilities regarding scientific communication in English after participating in KSISF.

3. Future Endeavors

To prepare for development phase four, we are continuously collecting data on student learning to understand which practices are most effective in fostering engagement and ability. We plan to redesign our surveys to distinguish between motivation, self-concept, and generalized self-efficacy, following the model of Marsh, et al. (2019). As authentic learning opportunities like KSISF have shown to be helpful in improving student self-perception, we aim to provide more of these opportunities to develop student interest in international awareness. We also aim to expand currently existing partnerships to help teachers further align their instruction with the SSH goals, possibly including research-practice partnerships.

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