

**CoRe: Content Representation Tool
(Loughran, Mulhall, & Berry, 2004)**

| Big Ideas/Concept: | Science is socio-culturally embedded product. |
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| 1. What you intend students to learn about this idea | Science is a part of society. Science is influencing our society and culture. At the same time our society and culture also give influence on science. Scientists are members of science community as well as their society. |
| 2. Why is it important for students to know this | <ol style="list-style-type: none"> 1. Elementary students usually tend to understand more concrete and reality related ideas. 2. Elementary students need to understand that science is not far from their own lives. 3. Teaching this idea helps them to appreciate the technology that they are using every day. 4. Teaching this idea helps them to make right judgment on the social effects of science (e.g. ethical issues). (Driver et. al, 1996) |
| 3. What else you know about this idea (that you do not intend students to know yet). | Kuhn's paradigm shift refers social and historical aspects of theory development. According to Kuhn, scientists are trained within a certain paradigm. Normal science community provides a surrounding socio-cultural environment for scientists. Within a paradigm, scientist investigates research that is acceptable to the normal science community. Dorothy Warren (2002) points out that social and cultural factors such as finance and funds, consumer demand, social conditions, environmental issues, and ethical dilemmas are also influencing on scientific enquiry. Feyeraband argues "free society" that is ideologically neutral between ideologies. However, scientific research cannot be free from ideology of a society that scientific institute belongs to. |
| 4. Difficulties/limitations connected with teaching this idea | <ol style="list-style-type: none"> 1. Current "cookbook style" textbooks, state or school district science curriculum, teachers' misconception of NOS could be general barriers for teaching NOS in class. 2. Lack of existing curriculum on this topic also can be a difficulty a teacher has because it requires quite amount of time for teacher to develop his or her own curriculum. 3. Teachers could not find chance to learn how to teach socio-culturally embedded aspect of NOS. Even only few research finding support the teaching method. 4. Cognitive development level of students is a factor to be considered. 5. Teacher should be better careful to use the term such as data, prove, theory, hypothesis, laws because students could have misconception or confusion in using those terms. 6. The languages in NOS seem to be difficult for elementary students to understand. It will be difficult work to modify the languages to the level of elementary students. |
| 5. Knowledge about students' thinking which influences your teaching of this idea | Driver and her colleagues (1996) report that younger children (age 9) showed difficulties to understanding the social and cultural aspects of NOS. Regarding children's cognitive developmental process, it might be impossible for lower graders to articulate the social and cultural aspects of NOS. However, upper grades might get ready to accept and internalize the idea. Level of language (vocabularies) can be hard for elementary level students. |
| 6. Other factors that | Recent science-related social issues (e.g., stem-cell research scandal, rally against importing beef from USA) in Korea |

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| influence your teaching of this idea | pushed me to teach social and cultural aspects of NOS even to young children. |
| 7. Teaching procedures (and particular reasons for using these to engage with this idea) | <p>Explicit, reflective and content-embedded instruction: (reason: high order thinking) Target: 3-6 grade elementary students Content of teaching: soil</p> <ul style="list-style-type: none"> • Introduce the story about Alfred Nobel, dynamite, and Nobel prize (read aloud children’s version of biography of Alfred Nobel) • Ask them to think the effects of dynamite on our society (good parts/ bad parts) and then make a chart • Explain them then relationship between science and society • Relating content of teaching to social and cultural aspects of NOS • Explain (show a picture movie or read aloud a book about) the relation between soil and chemical fertilizer • Ask them to discuss advantages and disadvantages of chemical fertilizer on soil and farming • (My second grade daughter insists they need to go to field trip to a farm and listen the effects of fertilizer from a farmer not from a teacher ^ ^) • Ask them to think about how a chemist, a farmer, and a consumer can have different opinion on using of chemical fertilizer in these day • Role-playing: a chemist who develop chemical fertilizer, a farmer, a consumer, a child • Journal writing after role-playing |
| 8. Specific ways of ascertaining students’ understanding or confusion around this idea (including likely range of responses). | <p>After or during teaching NOS, it will be helpful to assess the effect of teaching by interviewing students or using questionnaires. Using formative assessment probe or concept cartoon will be good ways to do. But it will be better to use open-ended questions than multiple-choice ones.</p> <ul style="list-style-type: none"> • Use questions asking them to explain the relationship between historical science discovery or invention and our lives or society. (e.g., How did Edison’s invention of electric bulb relate to our society or culture?) • Card sorting activity (see Appendix for modified card sort task for elementary students) |

Appendix

Card Sort Activity – Elementary Version

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| 1. Scientists must follow a step-by-step scientific method. |
| 2. Not every activity in science is an “experiment.” |
| 3. The scientific community is quickly convinced by new evidence. |
| 4. Western science is the only science. |
| 5. What scientists are studying has nothing to do with our society. |
| 6. Science is more than human achievement. |
| 7. All work in science is reviewed to keep the process honest. |

8. Scientists are particularly objective.

9. Historical scientific findings are still influencing on our lives.

10. Scientists are free from social pressure.