Hide, Map and Seek:

Assessing students' understanding of location and direction

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In this article Leicha Bragg introduces an open-ended assessment task that gives students the opportunity to access skills and knowledge from the Measurement and Geometry strand. Students take on the roles of cartographer and map user to 'hide, map and seek'.

Shifts in perceptions of geometry are evident in historical changes to our curriculum frameworks. The recent *Australian Curriculum: Mathematics* (Australian Curriculum Assessment and Reporting Authority, 2012) merged geometry with measurement into one content strand. "Measurement and Geometry are presented together to emphasise their relationship to each other, enhancing their practical relevance" (p. 4). If the focus has shifted to emphasising the connection between measurement and geometry then we must explore ways to build on that relationship. *Location*, particularly in the form of mapping, is a fitting area to enrich and solidify this bond. However, prior to developing students' geometric thinking through mapping, we must first assess their knowledge. In this paper, I argue that the *Hide, Map and Seek* assessment task can be a successful tool not only for assessing all primary students' understanding of maps, but also for enhancing their knowledge of the essential components of map creation and map reading.

Map making and reading are important skills that are utilised across a range of disciplines (Youngblood, 2006) as well as curriculum areas including geography, economics, history, science, and literature. They allow us to access economic and social shifts visually across time and place. For educational purposes we map students' academic progress and even map our own minds!

Recently, good use has been made of maps in some research and development projects.

Figure 1. Year 1 child hiding their object.

In Perry and Howard's (2008) *Mathematics in Indigenous Contexts* project, mapping was utilised by rural students to identify changes in the land over time. The mathematical elements of maps were bought to the fore by Lyon and Bragg (2011) when students plotted and prepared maps of garden beds for their *Kitchen Garden Project*. Tromp and Davis (2007) ignited students' interest in mapping through the miniature recreation of a motor racing track as a way of merging the curriculum areas of geography and mathematics. These approaches have merit, and their strength lies in their authenticity. The projects also address *some* of the key aspects of 'location' as outlined in the Australian Curriculum (ACARA, 2012):

- Describing position and direction;
- Interpreting the everyday language of location and direction;
- Interpreting simple maps;
- Following and giving simple directions;
- Co-ordinates and triangulation;
- Using representations of objects and their positions;
- Constructing arrangements of objects from a set of directions; and
- Using simple scales, legends, and directions to interpret maps.

However, the above tasks do not immerse students within the map through the authentic dual roles of cartographer and map user. Further, methods utilised for assessing students' spatial contextual knowledge, particularly maps, is more often achieved through quizzes where the location or setting of the map or the symbolical representations have little personal meaning for students (Dunn, 2011). I wish to argue that the *Hide, Map and Seek* assessment task can do this well, as students witness firsthand the complexity of mapping as a consequence of the examination of a map's functionality.

The *Hide, Map and Seek* task described below has been used with a range of age groups, from five year-olds to 65 year-olds, to further develop the concept of location. Location related to mapping first appears in the *Australian Curriculum: Mathematics* in Year 2: "Interpret simple maps of familiar locations and identify the relative positions of key features (ACMMG044)" (Australian Curriculum Assessment and Reporting Authority, 2012, p. 24). However, the task has been used effectively with children in the first year of schooling through to lower secondary school students, as well as in an adult numeracy development program. *Hide, Map and Seek* has also been employed with preservice teachers, teachers, principals and teacher educators with over 35 years of experience in education. Across the different ages and experiences, the instructions described below have remained the same, without modification. Due to the open-ended nature of this assessment task to ascertain core understandings of mapping, it has not been necessary to adapt the instructions. This effective formative and summative assessment task is detailed below.

Hide, map and seek in the classroom

To commence the *Hide, Map and Seek* assessment task, provide each student with an object, an A4 blank sheet of paper and pencils. Ask the students to draw their object on the paper and record its characteristics (see *Instructions to the students* insert). Sorting objects or any items found in the classroom are useful for this task. For example, provide students with foam dominoes of different colours and number combinations. The students draw a rectangle, the appropriate dots and write the colour of the domino on the paper. It is important not to let the students know at this stage that this is a mapping task.

Next, the students hide the object somewhere in the classroom. (see Figure 1)

Witness the excitement level rise at this point as the students dart backwards and forwards across the room trying to assess the best hiding spot. Continue not to reveal this is a map-drawing task as this knowledge may impact on their placement of the object.

The students return to their seats and turn their paper over to the blank side. Ask the students to sketch a map detailing where their object is located, using as few words as possible. Remind the students not to look at anyone else's map during this time. The key to this task is to assess *their* understanding of maps at that point in time, not their interpretation of the work of the child next to them. Allow the students approximately five minutes to complete the map. Figures 2 and 3 show examples of students' initial maps. On occasion, children may ask questions about what to include in the map. Try to avoid providing any further directions at this stage and simply reiterate the instructions while encouraging them to draw what they want to include on the map. This approach allows you to access the students' current understanding of mapping.

Now the real fun starts. Ask the children to trade maps with a partner who does not sit near them and find their partner's object. Remind students not to tell their partner where the object is, no matter how much they will want to divulge the secret, and definitely not to provide clues like "Warm, warmer, hotter, hot!" as this is counterproductive to interpreting the map to find the object.

Reflecting on the maps

Once students have found the object, ask them to provide feedback to their partner on the aspects of the map that were helpful or confusing. The strength of this feedback is that it is immediate, targeted at the individual's map, and therefore useful for improving the child's future mapping skills.

Bring the whole class together, encouraging them to share what they found helpful or confusing with the maps so that the group will benefit from their insights. Reiterate the need to articulate the confusing aspects of the maps so that all students become aware that some elements of their maps may not be easily understood by others. Typically, the first point raised is the orientation: either the map has been easy or difficult to orient. For example, a familiar student comment while students rotate the map is, "I don't know which way the map goes." Positive experiences with the orientation are signified by students commenting, "The door on the map helps me to know how to hold the map," or "I can see the teacher's desk on the map so I know where to go." Commonly, a child with some experience with mapping will raise the presence of "north" on some maps and the use of a compass rose. This is an ideal opportunity to show children a handheld compass and examples of maps with a compass rose or north depicted.

Children often raise the issue of the inaccurate portrayal of symbols on the map, having been unsure about what the symbols represented. This may be impacted by their lack of experience with images from a

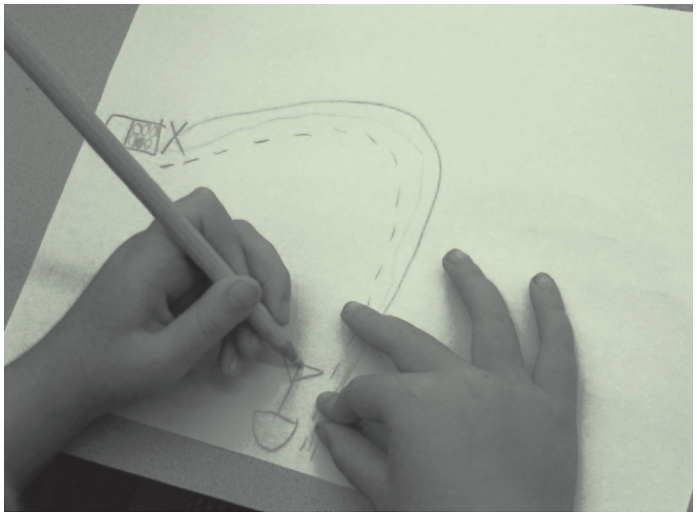

Figure 2. First round map drawn by Year 1 child.

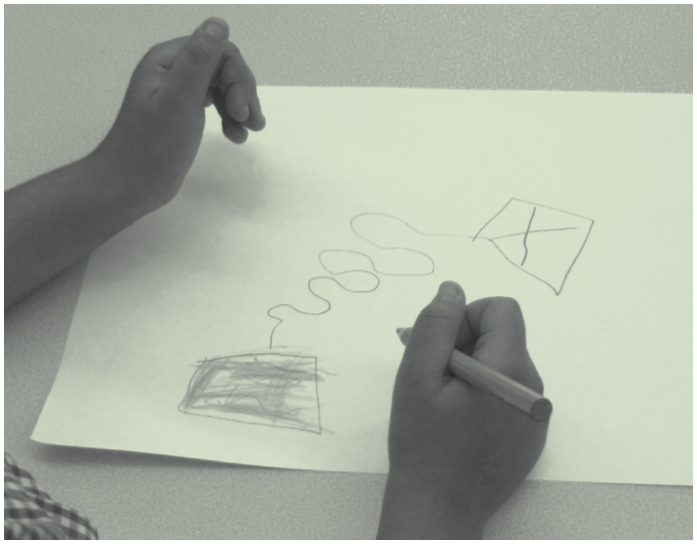

Figure 3. First round map drawn by Year 1 child.

Figure 4. Second round map drawn by Year 1 child.

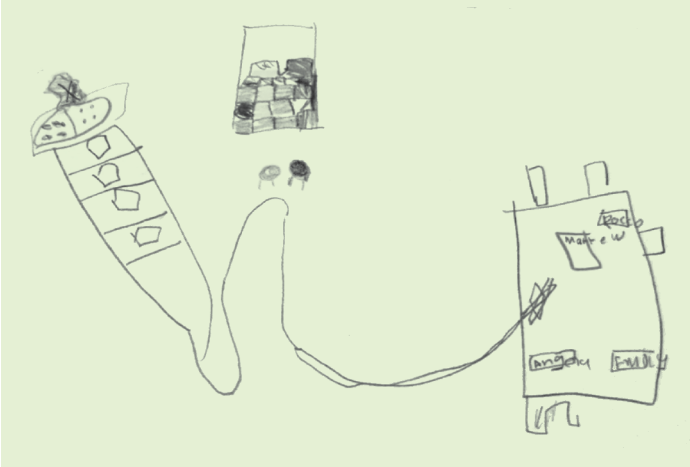

Figure 5. Second round map drawn by Year 1 child.

bird's-eye perspective but equally it appears that difficulties with scale come into play when the symbols have been drawn too large in relation to the space. This enlarging of particular items in the room appears to be more common in maps from children in the junior grades. It might be that these items are significant to the children for the purpose of providing detail and therefore they envisage them larger than in real-life.

During the discussion, you might introduce students to BOLTSS (Victorian Curriculum and Assessment Authority, 2009). BOLTSS is an acronym typically used in Australian secondary school geography classes to remind students of mapping conventions and stands for: Border, Orientation, Legend/key, Title, Scale, and Source. As a result of the feedback and trialling of the maps, students understand the significance of some of the key mapping conventions. They have had immediate experience with the importance of mapping conventions and their need for the inclusion and accuracy of these aspects.

Repeating the task and further reflection

After discussing the helpful and confusing elements of the maps, repeat the *Hide, Map and Seek* task again. Students are requested to select a different object to hide, to place it in an alternative location to their first position, and to map this new object's hiding spot. Figures 4 and 5 show examples of students' second-round maps.

At the conclusion of the task, students are encouraged to reflect on the development of their mapping skills as demonstrated from the first to the second map. Ask questions such as: What differences were there in your maps? What important components did you include in the second map? Why? If you were to draw another map what further components would you like to include to assist someone using your map?

This reflective process and examination of the before and after maps assists students to witness first-hand their growth in mapping skills. A Year 1 student who engaged in this reflective process proudly commented, "My second map is so much better than my first one. I've now got windows, tables and a door so that you know what you are looking at. I've put a big red X on the map so you can find it." A study of this child's first and second maps revealed a significant improvement in depicting key features of the classroom that would assist a user of the map to accurately determine its orientation. It is common for an X to mark the spot in many second maps, thereby further assisting with the location of objects.

Reflecting on the experience

When researching the use of this task with Year 1 children, the growth in the complexity of the students' maps from the first map to the second map was truly startling. Children's maps that were hardly recognisable as maps of the classroom in the first iteration now demonstrated thoughtfulness about the surroundings and structures with careful attention to detailing significant symbols in the second iteration. For students to create

a map, they need an understanding of the interrelationship between the space they are mapping and the symbols that represent their environment, and this too was much more evident in their second maps.

The authenticity of this task through hiding, mapping and seeking an object with a peer's map was appreciated by the students, whose enthusiastic remarks included, "The best part of doing this was getting to use my own map and see if it works." This authenticity is often absent from mapping tasks which require reading a map without context, based in a location they may never visit. Through the *Hide, Map and Seek* task, students place themselves within the maps and consider the function of the map from the user's perspective, because they too become the user of a peer's map. The students understand and appreciate the dual role of cartographer and map reader within the parameters of this one simple assessment and learning task.

In summary, the strength of the *Hide, Map and Seek* task is as a formative and summative assessment tool for learning. The task allows the teacher to assess the elements of the students' maps that require further attention for each child and the class as a whole. The task also allows the students insight into their mapping needs. For instance, a teacher may notice that the students' symbolic representations in their maps are not accurate, then decide that tasks encouraging the development of how to depict bird's-eye views would be sought to assist the students (see Bragg & Skinner, 2011, pp. 25–26). Further areas for exploration and expansion of an understanding of orientation may include tasks such as *I am north* which assists students "to see at first-hand the connection between geometry (orientation and angles), measurement and number" (see Bragg, 2012, p. 8). The *Hide, Map, and Seek* task can be repeated at the end of a unit on mapping to examine the growth over time of the students' knowledge. This task raises the teacher's and students' awareness of the key elements of mapping skills, what aspects require further attention, and thereby enhances their understanding of location and direction.

Acknowledgement

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