



METRICS FOR 21ST CENTURY LEARNING SYSTEMS

DRAFT PAPER

EXECUTIVE SUMMARY

The outcomes desired from 21st century learning systems are significantly different from those we have sought from system learning in the past. Thus we need new metrics to assess the progress and performance of our learning systems.

The process of agreeing those metrics can help in the creation of a shared vision for what our systems should achieve and how they should be shaped in the future. In this way system metrics can play a central role in developing a broad commitment to transformation amongst system stakeholders. They can also provide a spur to on-going improvement and innovation within the system.

To achieve maximum benefit from system metrics, they should be methodologically valid and able to provide consistent information over time, be seen primarily as a formative tool and support the engagement of a broad range of stakeholders in the task of system transformation.

It is proposed that metrics need to be developed in four different domains:

- those that provide information on the state of the system and particularly its potential to deliver 21st century learning outcomes
- those that provide information on the extent to which learning processes are exhibiting the characteristics expected to support successful 21st century learning
- those that provide information on the extent to which 21st century learning outcomes are being achieved and
- those that provide information on the life outcomes achieved by 21st century learners.

An indication of possible metrics and methods of assessment is set out in the Table 1 below. Assessment using tools that already exist appears possible in some of the domains. However in each domain further development of tools would be required to provide the breadth of information that would be desirable.

Using existing information and new metrics as they become available, we suggest the development of a dashboard to guide the development of 21st century learning systems. This dashboard would comprise a set of dials (based on a confirmed set of metrics) that provides insight into different aspects of system function and outcomes. Some of the dials might not be operating at first but could become operational as new tools were developed.

Moreover, if desired, an overall indicator of the current state of system progress could be made available by developing a weighted index of the different metrics to produce an overall index score for the system. The weighting on individual metrics might change over time as new tools develop or jurisdictions expand their understanding of what is most important. Such an approach would allow individual jurisdictions to apply different weighting to different metrics according to what they saw as important, although a common set of weights would be required to enable comparisons between systems.

What appears necessary to achieve this is an overall programme to drive the sourcing and development of measurement tools and co-ordination between systems to enable their use of this information to be developed in an integrated way.

The role the GELP community might play in this warrants further discussion.

TABLE 1: SUMMARY OF POSSIBLE METRICS AND MEASURES

Domain	What to Assess	How to Assess
Learning System	The ability of the system to support 21st century outcomes through clarity of goals, professional capability and enabling policy settings	Qualitative surveys of perceptions, understanding and attitudes of key stakeholders e.g. extension of some of the questions asked currently in TALIS and the GELP system diagnostic tool.
Learning Process	The extent to which the learning processes exhibit characteristics consistent with what the evidence suggests is required to produce 21st century outcomes	Use of surveys of students and teachers capture how current processes are being experienced e.g. student engagement surveys currently in use in some systems
Learning Outcomes <i>Cognitive</i> <i>Intra-personal</i> <i>Inter-personal</i>	<p>Focus on problem solving, critical thinking, information and ICT literacy and creativity</p> <p>Persistence, resilience, adaptability, self- management, appreciation of diversity and values</p> <p>Communicating and understanding others’ ideas, working with others, reconciling different perspectives and leading and making decisions</p>	<p>Extend current OECD assessments (e.g. PISA) and studies such as the International Study of Information and Computer Literacy studies or develop new customised tools</p> <p>Self and peer assessment of attitudes and capabilities. Maybe extended use of the International Civics Study.</p> <p>Surveys based on psychometric profiling and self-reporting. Longer term potential to use computer simulations</p>
Life Outcomes	Economic and social activity, values, on-going learning, wellbeing, life satisfaction.	Some existing economic and social surveys may offer insights but new tools likely to be required e.g. to assess the nature of economic activity

INTRODUCTION

One of the features in the development of schooling systems over the last twenty years has been a greater transparency in how those systems are progressing at both a national and international level. Information on how system performance changes over time and how different national systems compare has highlighted areas where improvement is needed and supported learning from what is done well.

The development of twenty first century learning systems should similarly be supported by appropriate metrics that provide evidence as to what is happening in those systems and feedback that supports their further advance. The questions this paper seeks to address are what metrics are appropriate for such a task and how might they be implemented. In addressing these issues we examine:

- what the learning outcomes are we should seek to achieve in twenty-first century systems
- what possible metrics are to enable systems to monitor their progress towards achievement of those outcomes and
- options for the GELP community and individual jurisdictions to implement these metrics both in the short term and over time.

THE PURPOSE AND DESIRED CHARACTERISTICS OF METRICS FOR 21ST CENTURY SYSTEMS

Measurement of the performance of a system is foundational to the long term effectiveness of that system. Well known academic and writer on public services, Mark Moore, notes in his recent book *Recognising Public Value*¹ that public value scorecards used prospectively can help promote a more productive dialogue about the value the public want public agencies to pursue and used retrospectively can not only enhance government accountability but promote innovation and learning.

This is quite clearly the case in education, particularly as we contemplate the challenge of creating a twenty first-century learning system. The process of development and articulation of metrics to measure progress can be used to both re-define and promote acceptance of objectives for twenty-first century systems. In this way metrics can be a driver for transformation. And through the collection of information and its analysis can come better understanding of how a system is progressing. Understanding of what is working and what is not provides the basis for both improvement and innovation. This is something that is especially important when the development of a 21st century learning system is largely uncharted territory.

So system metrics can and should have a central role in system transformation. The very fact that we are engaged in transformation means that the metrics we have used in the past will not be adequate for the future. If what you measure is what you get, then we need new metrics for our learning systems because we want new things.

Metrics predominantly in use currently focus on the measurement of a rather narrow range of knowledge domains. In the future, we will continue to be interested in knowledge, but we will be much more interested in what our young people can do with knowledge through the competencies they possess. The National Research Council in the United States has suggested a framework for thinking about this which focuses on cognitive, inter-personal and intra-personal competencies.² These are not only the competencies that will help learners to participate and succeed in high value economic activity but they are also the competencies that will equip young people to live in the modern world and to be effective contributors to broader economic, social and environmental goals. Current methods of assessing learning outcomes do not, for the most part, cater well for the measurement of these competencies or all of the life outcomes that might desirably flow from successful learning.

In order to fulfil these purposes the metrics we develop for 21st century learning systems should display the characteristics listed below.

- The methods of gathering evidence should be reliable and robust over time. This is a challenge given that much of

what we are interested in requires assessment of less routine and more personalised capabilities (including learners' understanding and conceptual strategies).

- Ideally the metrics we seek to develop would also support comparison between systems, given how powerful this has proven to be in recent years in motivating the desire for improvement in some systems. However we need to recognise that at least for some metrics it may be very difficult to achieve the reliability of measurement to enable valid comparisons across systems.
- Metrics should provide insight not only into the state of learning outcomes but also the state of the system itself and particularly the extent to which the conditions exist to support transformational goals.
- Metrics should support and improve decisions at all levels of the system. As briefly touched on above, metrics should provide sufficient information to allow decision makers to not only understand the current state but also obtain a perspective on why it is that way and what might be done to move forward. While our focus is on metrics at the system level, some of the concepts and indeed even the tools would ideally also be able to be applied at a district or institutional level to enable those levels to gauge the overall level of fit with what we aspire to achieve in a 21st century system. A strong emphasis on using metrics for formative purposes as opposed to accountability will foster a culture where key decision makers throughout the system embrace the new metrics and actively use them to improve and innovate within the part of the system for which they are responsible.
- If the system of metrics is to be a driver for transformation within the system, the process of development and measurement should involve and inform a broader range of stakeholders. If students, families, policy makers, philanthropists, social innovators and resource developers all agree that the metrics reflect what is important and are using information as it becomes available to inform their own role in the system, the overall drive for system transformation is likely to be much stronger.

1. Do members of the GELP community endorse these purposes for developing new system metrics?
2. Do you agree with the suggested characteristics of the metrics? Are there others that should be added? Are there trade-offs that might need to be made in terms of the weight placed on particular characteristics?

WHAT SHOULD THE METRICS COVER?

Life outcomes

Ultimately we are interested in the impact participation in learning has on the lives learners subsequently live. So it makes sense to try and establish metrics for assessing the life outcomes of the “graduates” from our learning systems. Over time this will improve our understanding of whether our systems are focusing on the right things and in the right way. The task is not an easy one because concepts of what represents quality life outcomes inevitably have a level of subjectivity about them, the outcomes are long term ones and their direct links to the learning system may be tenuous. But it is reasonable to assume that good outcomes for learner will include a mix of some or all of the following:

- successful participation in the economy and society
- fulfilment of responsibilities with respect to citizenship
- personal wellbeing
- passion for on-going learning
- capability to make good life choices
- satisfaction with life.

Learning outcomes

While life outcomes are the ultimate goal, evidence of impact on these will only emerge over the medium to long term, and indeed even then may not be able to be tightly tied to what happens in our learning systems. We need to also be very focused on the set of outcomes which, based on the best evidence currently available, an individual will ideally be endowed with for successful living and contribution in the 21st century.

There is much that has been written on the subject of what learners should learn in the twenty first-century and many slightly different ways of presenting the information.³ However there is a strong level of agreement about the core based on understanding from learning sciences and observations of the way the world and activity within it is increasingly organised. That is that in the future successful learning will produce deep understanding that involves the ability to analyse issues, create solutions and generate new knowledge. It will involve an ability to interpret and utilise information from a wide range of sources to produce understanding and insight. But it also involves knowing how to collaborate with others, drawing on their ideas and contributing to the thinking so as to collectively generate new knowledge and make decisions and provide leadership when required. Successful learners will have strong capability to manage themselves, to adapt and persist through a range of situations, to self-regulate their behaviour and to be open and respectful of diverse points of view. They will have a passion for and ability to manage their own on-going learning. Finally they will have a sense of ethics and responsibility both locally and globally.

For the sake of convenience we draw in this paper on the taxonomy used in the previously referenced US National Research Council Paper. This identifies the key domains as:

Cognitive

Including:

- cognitive processes and strategies (e.g. critical thinking, problem solving, information literacy)
- knowledge
- creativity

Intra-personal

Including:

- intellectual openness
- work ethic and conscientiousness
- positive self-evaluation
- meta-cognition

Inter-personal

Including:

- communication
- collaboration (teamwork)
- leadership

Learning process

Subsequently we will explore possible metrics for these learning outcomes and expand on them further. However before doing so we should note that while it is necessary and indeed critical to develop metrics for outcomes, it may not be sufficient to have metrics only in these areas, especially in the short term.

This paper proposes that it will also be important to develop metrics as to what is happening within the learning process. This is for three reasons:

- Assessment tools for at least some of the outcomes listed above may take some time to develop, particularly if we want them to be robust and comparable. In the absence of these and any sense of what is happening within the learning process then there will be a large blind spot with respect to overall system development.
- It is difficult to be definitive or exhaustive as to outcomes that will be required for 21st century learners. Indeed a key attribute of future systems should be their dynamism and adaptability. New desired outcomes may emerge or the relative balance shift. By focusing on metrics for the learning process as well as the outcomes we reduce the risk of locking in too strongly on a fixed or narrow set of outcomes.
- Process understanding can help inform our overall view of what is working and what is not and why.

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- Of course focusing on metrics for the learning process is only valuable if we have a clear sense of what the key attributes of desirable learning processes are. Fortunately in this area as well there has been a good deal of thinking based on what research suggests and there appears to be a reasonably strong consensus.⁴ Charles Leadbeater in his paper “Rethinking innovation in education”⁵ has summarised the thinking of a number of researchers and writers on the characteristics of successful learning in the future. What follows is an abridged version of Leadbeater’s summary of these characteristics:
- Learning is an active and engaged process in which people interpret knowledge and adapt it to new contexts and uses.
 - Engaged learning is impossible unless the learner feels motivated Brain science is providing us with a flow of new insights in the emotional and rational aspects of learning and the way they interact.
 - To be motivating learning has to feel a personal rather than a standardised experience. Even if much of the content of what is learned has elements of standardisation, the experience of learning it ...needs to be personalised, to make people feel engaged and committed ... provision will need to be flexible and sensitive enough to meet different needs and capabilities in different ways; children should be encouraged to become investors in their own learning, as well as be given a voice in the process.
 - As well as feeling deeply personal learning needs to be highly collaborative. Personalised learning does not mean solo learning. Learning is an interactive process of dialogue, as much with peers as with teachers.
 - When people face complex tasks it is important that they understand underlying principles and how they should be applied in novel contexts. Rather than reaching for the “right” answer they need to adopt the right approach.
 - This kind of learning thrives on feedback, not just at the end of the course to test what has been learned but in the process of learning to guide and develop learning.
 - Learning needs to be stretching and challenging.
 - This kind of learning is a structured process; it is not a free for all
 - Learning should take place in a wide variety of settings, not just at school in a classroom.

Even if we cannot assess all the desired learning outcomes with confidence, if our learning processes are evidencing the characteristics above then our learning systems are very likely moving in the right direction in terms of the outcomes we seek. So being able to assess how we are doing on the characteristics outlined above is important.

Learning system

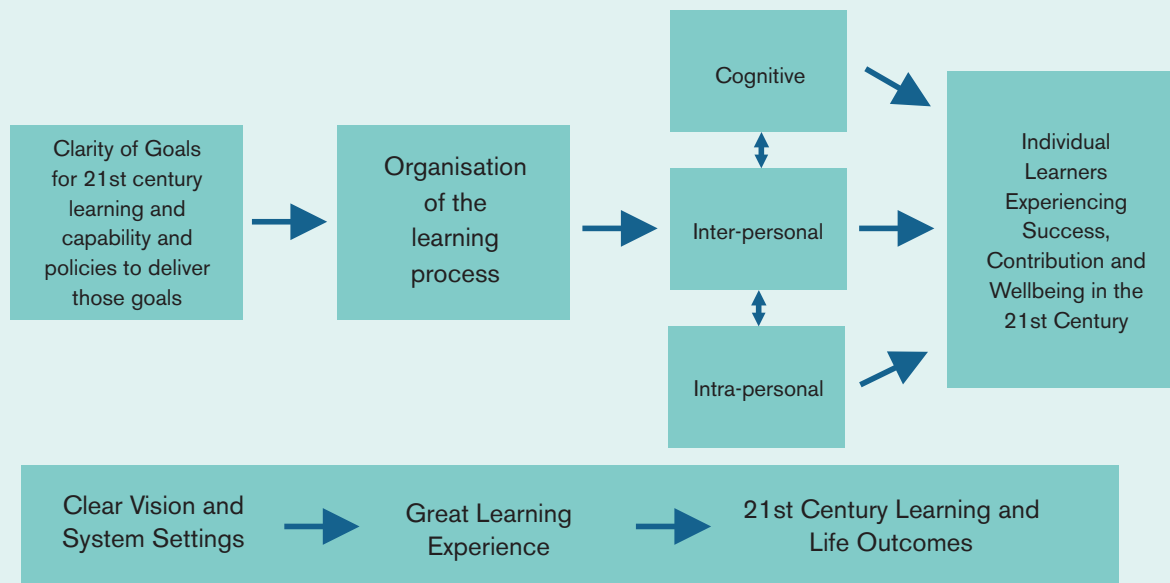
Finally there will be benefits in developing some metrics to assess the current state of the system, specifically with respect to the characteristics that might support system transformation and the ultimate achievement of 21st century learning objectives. The availability of such metrics will build understanding as to the factors driving learning outcomes and what might need to be changed in order to advance further towards the ultimate system objectives.

There are a number of dimensions that we might be interested in:

- First, having clear agreement on appropriate goals for our learning systems is critical. Without these, the system is unlikely to move coherently in any direction, let alone the one that will support 21st century outcomes. The existence of such goals should shape practice and ultimately provide the benchmarks against which we might seek to measure our success.
- Second an understanding of the current state of capability within the system to deliver on the desired outcomes is also essential. This might cover both the competency of professionals but also their attitudes about a transformation agenda and their understanding of what is required in terms of practice to realise it.
- Finally an assessment of system settings in terms of the factors that might support and enable innovation is also important. The extent to which policy enables or impedes the exploration and adoption of changed approaches to either learning organisation or practice should also inform understanding of current system outcomes and the potential for them to be greatly different in the future.

In summary there are three to four levels at which we might want to establish system metrics, as outlined in Figure 1.

Figure 1: Logic Flow for Selection of Indicators



3. Do members of the GELP community agree that it would be useful to identify metrics at each of the levels indicated?
4. Do you agree with the sorts of attributes that we might be interested in having metrics for at each level? Are there any significant omissions in your view?

THE METRICS IN DETAIL AND HOW THEY MIGHT BE IMPLEMENTED

In this section we explore in more detail what the metrics might assess and how this might be done, starting at the left of Figure 1 and moving across.

STATE OF THE SYSTEM

What might we assess?

As we have just discussed, a system that is to achieve 21st century outcomes for learners needs to set out to do so. It also needs to have in place the capabilities to deliver on these objectives and the policy settings to enable it. So it would seem useful to gather evidence about:

- the degree to which the espoused learning objectives for the system through curricula, standards and assessments reflect 21st century learning objectives
- the degree to which professionals in the system understand 21st century learning goals to the extent that they exist and understand what advancing them might imply for learning processes
- the degree to which professionals in the system agree with 21st century learning goals
- the degree to which professionals within the system feel competent and confident to advance transformational practice
- the degree to which professionals within the system feel they have the tools and established processes to advance transformational practice
- the extent to which a range of stakeholders (both within the system and outside it) see regulations governing entry to and exit from the system, accountability, knowledge flows and funding policies as enabling or impeding innovation and change.

How might it be done?

Evidence could be gathered on the current state with respect to these questions through qualitative surveying. GELP has already developed a system diagnostic tool that contains relevant questions. In it respondents are asked to provide an assessment of statements such as:

“ In addition to knowledge acquisition, the curriculum provides a holistic approach to the development of skills, values and attitudes for 21st century living.

The curriculum is designed to be flexible and adaptive to knowledge of what will be required in the 21st century.”

In addition, TALIS is an existing OECD sample survey of teachers and professional leaders that many jurisdictions already participate in and which also already contains some questions on beliefs, values and attitudes of the sort that would be valuable for the task in question. For example TALIS asks teachers to respond to questions about the relative role of the teacher and learners in the learning process. This questionnaire may already provide valuable information for jurisdictions who have participated in TALIS as to how fertile the professional ground is for system transformation.

A possible approach would be to construct a set of questions like this and ask respondents whether they agree or disagree with the statement or indicate the strength of their agreement.

Our suggestion is not that these questionnaires are completely right for our purposes currently but that they demonstrate that it is possible to develop questionnaires that might be fit for the purpose of providing metrics for our first level of indicators.

5. Do GELP community members agree with the suggested areas for assessment with respect to system readiness and the proposed method of assessing them?

WHAT IS HAPPENING IN THE LEARNING PROCESS

What might we assess?

In the previous section we outlined the important attributes of the learning process that might be conducive to 21st century outcomes. Most of these attributes relate to what actually happens for the learner in the learning process. Therefore it would be important to obtain evidence on the extent to which learners in our system:

- are motivated to learn and engaged in learning both within school and other areas of their life
- believe they are actively generating new knowledge as opposed to being passive receivers of knowledge
- view the role of the teacher/tutor as supportive and valuable to their learning
- see their learning activities as relevant, connected to the wider world and interesting to them personally
- feel they have are able to influence the direction of their learning in dialogue with others
- see themselves as learning from their peers and enjoy the opportunities to work with other
- find the learning process both challenging and well structured
- find assessment useful in terms of informing them as to how they progressing and where they might need to focus next in order to progress their own goals
- use ICT in much the same way as they would in other aspects of their life
- can apply new knowledge in different aspects of their personal lives
- feel they can build and continuously revisit their future plans for learning and life.

How might it be done?

Student engagement is central to 21st century learning and there now exist in many systems tools for measuring student engagement in a standardized manner.⁶

Assessment of the strength of learner perspectives in the other areas outlined above through similar surveys appropriately constructed and validated is similarly possible. This could include peer and teacher evaluations as well as self-reporting in order to strengthen the validity of reported responses.

The OECD survey of 15 year old, PISA, already includes similar questions as part of its background information gathering. In the 2006 survey it asked students whether they agree with statements such as:

“I enjoy acquiring new knowledge in science problems” and
“I generally have fun when I am learning science topics”

Modification and extension of such questions either in PISA or as a standalone survey could capture information on how the learning process is being experienced by students and whether it is moving in the direction that we think would be supportive of 21st century outcomes.

Do GELP community members agree with the suggested areas for assessment with respect to the learning process and the proposed method of assessing them?

KEY LEARNING OUTCOMES

We have previously used the National Research Council taxonomy of key outcomes domains (i.e. cognitive, intra-personal and inter-personal) and it is useful to continue to use these. Each is discussed in turn below. In addition, in the discussion below of each of the outcome domains, the proposals on what we might assess and some of the suggestions for assessment incorporate thinking from a more comprehensive analysis set out in the Assessment and Teaching of 21st Century Skills working paper “Defining 21st Century Skills.”⁷

COGNITIVE

What might we assess?

This field covers both knowledge and clusters of competencies such as critical thinking, problem solving, information and ICT literacy and creativity. We should be interested in assessing a number of outcomes for learners in this area like:

- their level of knowledge in key domain areas (language, science and maths seem to be strong contenders to remain important)
- their skills in solving problems in areas with which they are familiar and to also apply frameworks and knowledge developed in specific discipline areas to solve problems in contexts with which they are unfamiliar
- their skills in analysing a range of information in order to draw conclusions and generate new knowledge
- their skills in innovating and creating through inquisitiveness and imagination
- their skills in being able to access, manage, use and present information from a wide range of source, particularly using ICT.

It should be re-emphasised that in each of these areas, we are interested in observing what learners can actually do rather than assessing some construct of what they know about what they should do.

Some discussion is required as to whether or not desired knowledge outcomes should be specified and assessed separately from skills. On balance it seems best not to do this as there is a high level of inter-dependence between the exercise of skills and the development of expertise in specific knowledge domains. That is, the deeper understanding we seek as a critical outcome will be the result of applying specific cognitive skills within a particular area of knowledge.

How might it be done?

Measurement of cognitive skills is a complex task. There would appear to be two options for advancing this area, either to continue to build more of what is required into the existing PISA assessment or to develop an entirely separate process, based in part on other instruments that have recently been developed.⁸

PISA is already moving down the path of assessing the sorts of outcomes we are interested in and aspires to do more. As well as assessing knowledge in particular domains it is also capturing the problem solving skills of learners. In the 2015 round it is intended to introduce an interactive problem solving component to the assessment. So looking to reinforce and accelerate the current direction of travel of PISA is one possibility for the more advanced assessment of cognitive skills.

Within the OECD suite of tools there are also other instruments that could be utilised or adapted. The OECD's Programme for International Assessment of Adult Competencies (PIAAC) is aiming to include a generic skills test using the Problem Solving in Technology Rich Environments instrument. Although it relies on ICT skills, its primary focus is on the cognitive dimensions of problem solving (the core processes), abstracting to as large an extent as possible from a specific knowledge domain. While PIAAC is an assessment for adults, once the basic assessment is established it should be possible to look at its applicability for younger learners. In the same way, although less advanced, the OECD's proposed Assessment of Higher Education Learning Outcomes (AHELO) may also offer opportunities.

The risk with relying primarily on OECD tools is that the development process might be slow, reflecting the consensual nature of the organisation. A more rapid path might be able to be achieved through separate development, leveraging the most promising of the various other cognitive assessment tools currently in use or under development. The risk with this approach is that it might not be possible to secure the critical mass of resources and capability required. Given the complexity of what is required it would be important not to fragment effort and jurisdiction focus across a number of developments.

Assessment of ICT literacy and information skills is something that has been invested significantly in by a number of researchers. A specific example is the International Study of Computer and Information Literacy developed by the Australian Council for Education Research which is currently being implemented.⁹ It aims to study an "individual's ability to use computers to investigate, create and communicate in order to participate effectively at home, at school and in the community". Reliance on this study or another like it would seem sensible for the purpose of obtaining metrics in this area.

The assessments outlined above are less well suited for measuring skills in creativity. This is an area that has to date received less attention and as a consequence is not well developed. The essential problem is how to assess in a reliable way something that by its very nature is very open-ended and subjective. A recent OECD Education Working Paper¹⁰ sets out a framework for assessing creativity and reports on two field trials of a new tool for assessing creativity in England by the Centre for Real World Learning at the University of Winchester. The first trial required teachers to assess student inquisitiveness by mapping individual student capability onto an assessment framework. The second trial examined student self-assessment of their own imaginative capability. The results of the study suggested such the approaches trialled are feasible. However there is clearly quite a way to go in this area and the challenge of reliability of assessment to support comparisons across institutions or systems is an especially significant one.

6. Do GELP community members agree that these are the critical areas to assess in the cognitive domain?

7. Are the proposed approaches to assessment appropriate? Are there alternatives that should be considered?

8. In particular are there alternative approaches not discussed above to assessing creativity that merit consideration?

INTRA-PERSONAL

What might we assess?

The intra-personal areas relates to the personal qualities an individual might have that enable them to manage themselves and their learning, to be resilient and adaptable in the face of change, to be persistent in the face of adversity, to be appreciative of diversity and to have a sense of social and environmental responsibility.

The sorts of things we might be interested in assessing include:

- capability to reflect on their own strengths and weaknesses
- capability to plan and manage their own learning
- ability to cope with change
- confidence to express their own views constructively
- levels of confidence in handling setbacks
- attitudes to and appreciation for differences in culture and opinion
- levels of interest in and concern for local and global issues.

How might it be done?

Assessment of these attributes could be done in a number of ways:

- development of surveys which capture learners' perceptions of their own attitudes and skills in such an areas. While most easy to do, simple surveys might be subject to potential bias from learners reporting what they thought were the acceptable answers rather than what they genuinely believed. More complex psychometric assessments could control for this and allow measurement of the degree of bias that might be present
- in some of the areas relating to social and global responsibility existing assessments could be used or extended. For instance the IEA's International Civic Education Study¹¹ is the best example of such a study and could be used to report a range of outcomes in this area
- more complex ICT based assessment that seeks to observe student attitudes through real and simulated challenges would be another option. However while likely the most valid, developments in this area are not well advanced and any usable tools would appear a long way off.

9. Do GELP community members agree with the suggested areas for assessment with respect to intra-personal competencies and the proposed method of assessing them?

INTER-PERSONAL

What might we assess?

The inter-personal area relates to competencies such as teamwork and collaboration, communication, conflict resolution and leadership.

The sorts of things we might be interested in assessing include:

- the skill of communicating one's own ideas clearly and to read and to understand what others are saying or writing
- the skill of working effectively with others to achieve a common task
- the skill of drawing on the ideas of others and of influencing the thinking of others so as to generate new knowledge
- the skill of helping groups to make decisions
- the skill of finding common ground with others holding different views and of maintaining constructive engagement even when differences remain

How might it be done?

The options for assessing inter-personal competencies are similar to those for intra-personal competencies. Again we

appear to be a long way from being able to use sophisticated assessments based on computer simulation, although the attempt to assess collaborative problem solving in the next PISA round is a first step in this direction.

In the absence of more wide ranging computer based assessment tools for inter-personal competencies we appear to need to fall back on psychometric profiling and self-reporting. Psychometric profiling as used in screening job applicants currently is reasonably reliable in producing an objective assessment of a person's preferred ways of working. Its use to assess how well a person's skills match a preferred benchmark may be more debatable.

This area appears in some ways to have the least available short term options for assessment to draw on.

10. Do GELP community members agree with the suggested areas for assessment with respect to interpersonal competencies and the proposed method of assessing them?

OVERALL LIFE OUTCOMES FROM LEARNING

As discussed above, ultimately we are seeking to endow each individual with an integrated set of capabilities that equips them for successful living in the 21st century. Should we or can we specify one or more indicators that enable us to assess our success in achieving this?

What might we assess?

When we look at the learning outcomes discussed earlier we are essentially still looking at the potential the learning process has created. When we look at life outcomes we are looking to see what that potential has realised. In a recent article Michael Fullan says this¹²:

"The fundamental purpose of education in an excellent system is to produce in all of its graduates – as close to 100 per cent as possible – the quality of leadership. By that we mean the capacity and commitment to act for one's own good and for the common good.

We could call this the "new entrepreneurial spirit"– a spirit characterized by innovation, risk-taking, commitment, and skilled problem solving in the service of a better future. But unlike previous definitions of entrepreneurialism, this one applies both to business and social domains. Innovation in new technologies is one aspect, but so are social innovations that build new communities and create opportunities for a better life."

This suggests that the scope of our metrics should be broad and, in particular, extend beyond our standard outcome measures in the areas of employment and income, important though these may continue to be. Possible areas that might be considered for metrics include:

- the types of economic activity the graduates from our learning systems are engaged in. This is not a question of industrial classification but the extent to which they are involved in the creation of new knowledge, problem solving, risk taking and innovation. More traditional measures of level of economic activity and earnings would of course still be relevant
- their levels of social participation. Again this is not just a question of participation but a matter of the extent to which individuals are actively engaged in initiatives to achieve social improvement
- their involvement in actions to promote human and environmental sustainability and the extent to which they are globally engaged
- the values they espouse and the actions they take to give effect to these values
- an individual's on-going learning activity
- an individual's health and overall wellbeing

How might we measure it?

Some of our metrics can be captured through existing longitudinal surveys of graduate outcomes and other national data collections e.g. census, employment and time use surveys. Others would require the development of new tools. As an example work done for NESTA in the UK recently has developed tools to assess the creative content of work.¹³ This could be a prototype for the sorts of measures we might be most interested in with respect to understanding the content of work that individuals are actually doing.

Beyond the standard measures that could be drawn off existing surveys, gathering of evidence in this area is likely to be complex and take considerable time. It may be that further development in this area should be accorded a lower priority relative to development of indicators that relate more directly to what is happening in the learning system and the outcomes that relate directly to it.

11. Is it feasible and desirable to develop metrics for life outcomes from the learning process? How high a priority is this?

12. If work was to be undertaken in this area, are this metrics suggested above the right ones to focus on? What are the alternatives?

13. Would it be sensible to focus on only one or two metrics in this area? If so which ones should be prioritised?

HOW MIGHT WE JUDGE OVERALL SYSTEM PROGRESS?

While we have canvassed a whole range of metrics in this paper, there might be a desire on the part of jurisdictions to have one way of summarising the overall state of progress of their system in moving towards a 21st century learning system.

One option for doing this might be seek develop one assessment that captured many of the dimensions we have discussed would be desirable – a sort of super PISA.

We appear a long way off having such an instrument. And the risk with trying to develop such an instrument would be that, in order to make it implementable, it would inevitably be necessary to simplify and narrow its focus. A single instrument that sought to capture all of the dimensions outlined in this paper may be very large indeed. The risk of narrowing and simplifying is that some of the desired dimensions of successful 21st century learning which are important in their own right, would be ignored or downplayed driving down the richness of the learning experience we seek to capture.

The alternative approach, which seems preferable, is to draw on a range of instruments brought together within an integrating framework. Individual systems might still want to focus on particular metrics because they believe those metrics represent the capabilities that are most important for their learners at any particular time. But they would do so in full knowledge that there are other capabilities that they are down playing.

Those who still seek a summary assessment of the overall state of their system, in terms of desirable 21st century properties, might still be able to do so. In producing *The Learning Curve*¹⁴, Pearson and the Economist Intelligence Unit assembled a range of indicators from different sources for a number of systems and developed a weighted index of those indicators to produce a single index number for each system. The same approach could be adopted with a set of indicators similar to the metrics outlined in this paper.

The index could draw together indicators from each of the levels we have discussed – system clarity and readiness, learning processes, learning outcomes and life outcomes. In the short term more weight might be assigned to the first two levels than in the long run for the simple reason that the appropriate outcome indicators are going to take longer to develop

at least in some areas. So the index may change in composition over time but this need not be a problem to the extent process indicators are a reasonable proxy for some outcomes indicators (e.g. experience of collaborative learning might reasonably be expected to develop stronger collaborative skills) and at any point every system would be using the same weighted index for those interested in cross-system comparisons. The latter would of course be dependent on applying the same weights to each system in compilation of its index number.

14. Is it desirable to attempt to construct some form of index to assess overall system progress with respect to twenty first century learning outcomes?

15. Is the approach suggested above desirable or are there alternative approaches that should be considered?

WThe roadmap would set out a plan as to what we were going to try to assess and by what means. In one sense it could be the further development of some of the ideas in this paper with clear agreement on what was important and how it was going to be achieved.

Driving the vehicle would involve implementing the plan. This might have a number of dimensions:

- working with jurisdictions to draw together data from existing assessments that might be relevant
- working with existing providers of international assessments (e.g. PISA, ISCIL) to encouragement their development in a manner that supports the agreed framework
- working to develop agreed surveys that will fill gaps and provide much needed information (e.g. on learner experience of the learning process)
- driving the development of new assessment tools in areas where it is seen that more sophisticated tools are required.
- acting to pull together a databank of evidence form agreed sources and producing an overall index of system transformation.

The question for the GELP community is whether it is willing to be in the driver's seat on this issue.

16. Are GELP community members willing to be involved in a process to take the development of system metrics forward in these different areas?

ANNEX 1: SUMMARY OF POSSIBLE DOMAINS, METRICS AND METHODS

Domain	What to Assess	How to Assess
<p>System readiness: Clarity of goals and capability and policy</p>	<p>Extent to which 21st century learning goals are well established formally within the system</p> <p>Levels of understanding and acceptance of those goals within the system</p> <p>Capability and confidence of profession to advance transformational practice</p> <p>Policy settings to foster and enable innovation</p>	<p>Diagnostic tools/qualitative surveys including building off existing instruments such as the OECD's TALIS survey and GELP's diagnostic tool</p>
<p>Learning Process Transformed learning opportunities</p>	<p>Extent to which learners are experiencing characteristics of the learning process that would be associated with successful 21st century learning (e.g. enjoyment, engagement, relevance, self-direction, collaboration, integrated, ICT rich etc)</p>	<p>Qualitative surveys of student and teacher experience. Existing engagement surveys are examples of what could be done across a broader set of issues.</p>
<p>Learning Outcomes <i>Cognitive</i></p>	<p>Depth of knowledge in key domains and performance in problem solving, critical thinking, information and ICT literacy and creativity within specific knowledge domains and potentially generically</p>	<p>Develop specific assessment of cognitive competencies either by expanding the scope of PISA and drawing on other generic instruments such as those being developed for PIAAC and AHELO or initiate a separate assessment. Instruments such as the International Study of Information and Computer Literacy are potentially very useful for assessing ICT and information skills. Assessing creativity likely to require student and teacher judgement.</p>

CITATIONS

¹ Mark H Moore (2013). *Recognising Public Value*. Cambridge Massachusetts: Harvard University Press

² National Research Council. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. Washington www.sites.nationalacademies.org/DBASSE/BOTA/Education_for_Life_and_Work/index.htm#.UWNw4ICN3IU

³ Examples include the Partnership for 21st Century Skills (www.21stcenturyskills.org), the Assessment and Teaching of 21st Century Skills initiative headquartered at the University of Melbourne (www.atc21s.org), Bernie Trilling and Charles Fadel's book *21st Century Skills* and the work primarily used in this paper by the National Research Council.

⁴ See for instance the OECD's "The Nature of Learning: Using Research to Inspire Practice" edited by Hanna Dumont, David Istance and Francisco Benavides (www.oecd.org/edu/cei/thenatureoflearningusingresearchtoinspirepractice.htm) which provides a comprehensive review of available evidence. The already cited National Research Council 2012 Paper "Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century" also sets out a research-based set of teaching methods to support the desired outcomes.

⁵ Charles Leadbeater. (2011). *Rethinking innovation in education: Opening up the debate* Centre for Strategic Education Seminar Series paper No 207.

⁶ For one such example see Charles W. Darr. "Measuring Student Engagement: The Development of a Scale for Formative Use" in S.L. Christenson et al. (eds). (2012) *Handbook of Research on Student Engagement*.

⁷ Marilyn Binkley, Ola Erstad, Joan Herman, Senta Raizen, Martin Ripley with Mike Rumble. (2010). *Draft White Paper 1 Defining 21st century skills. Assessment and Teaching of 21st Century Skills* <http://atc21s.org/wp-content/uploads/2011/11/1-Defining-21st-Century-Skills.pdf>. This paper contains a far more wide ranging discussion of possible metrics than is presented here.

⁸ For example the Educational Performance Improvement Centre in the US has developed the College Readiness Performance Assessment (C-PAS) which is intended to assess the key cognitive strategies of those planning to enter college. (www.epiconline.org/cpas)

⁹ See www.acer.edu.au/research/projects/the-international-computer-and-information-literacy-study-icils/ for more information

¹⁰ Lucas, Claxton and Spencer (2013). *Progression in Student Creativity in School: First Steps towards New Forms of Formative Assessments*, OECD Education Working Papers, No. 86, OECD Publishing.
<http://dx.doi.org/10.1787/5k4dp59msdwk-en>

¹¹ See <http://www.iea.nl/cived.html>

¹² Michael Fullan. *Great to Excellent: Launching the Next Stage of Ontario's Education Agenda* p.9 <http://www.michaelfullan.com/media/13599974110.pdf>

¹³ Hasan Bakhshi, Alan Freeman and Peter Higgs. (2013). *A Dynamic Mapping of the UK's Creative Industries*. NESTA. www.nesta.org.uk/library/documents/Dynamic_mappingV12.pdf

¹⁴ See www.thelearningcurve.pearson.com