

The Metacognitive Role of Independent Learning Skills in the Development of Students' Competence

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ABSTRACT

This article's aim is to reveal and inform essential, factual information on the metacognitive importance of independent learning in the development of competence of students in teaching and cognitive process. The data were collected using test and self-report inventory technique. The research also analyzes and shows that the students' competence in cognitive process and knowledge in independent learning on metacognitive skill.

Independent learning is the process whereby someone manages their own learning, rather than their learning being managed by a teacher. By 'managing' I do not mean the *action of learning*; learning, in that sense, is always independent – you cannot do your student's learning for them. But the *process* of learning involves far more than the action of learning. The process involves study and revision; writing and discussion; planning and reflection; monitoring and evaluation; and, perhaps, rewards and sanctions. A teacher often manages many of these tasks, to varying degrees throughout a student's education, with a reduction of most areas as a student moves through their education. Independent learning is where a student manages the process of learning themselves, rather than the teacher, such as the planning, monitoring and evaluation of their learning.

Independent learning should not be conflated with independent *thinking*. Independent thinking skills are those involved in reaching and defending one's own, critical, informed judgements. These two types of skills can develop independently of one another. Also, independent learning comes in a wide variety of degrees. As one increases the degree of independent learning throughout one's education, from school to university and beyond, one might engage in such activities as spending increasing time working on projects with decreasing guidance; setting more self-imposed deadlines and increasingly working to one's own schedule; sourcing and engaging in research with less guidance; learning with less instruction, if any; and self-evaluating one's own progress.

One need not be a complete autodidact in order to be an independent learner. While studying for a PhD is mostly a process of independent learning, a doctoral student has a supervisor (or several) from whom they receive feedback on their work; and a doctoral student typically discusses their work with and presents their work to their supervisors, peers and others working in their field. All of this is integral to the learning process of graduate study.

The best society is one with well-educated citizens. This has limits; a well-functioning society would

not be entirely made up of scholars or academics; and those who govern society need not remain in formal education until midlife. Plato would disagree with the final of these claims: those that would govern the just city-state he outlines in the *Republic* should receive an education until the age of thirty-five, followed by fifteen years of holding offices to gain life experience, before they would be ready to govern – if, that is, they excelled during those fifteen years.[1] Life experience, however, takes many forms; and it is possible to be *overeducated*. But we should strive to educate as many of our citizens as well as possible until at least their early adulthood, in school and then through whichever form of higher education they might choose to pursue thereafter.

Beyond the education we receive prior to and in the early stages of adulthood, while people can and should enrol onto continuing education courses, people should, more importantly, continue to *educate themselves*. That requires independent learning skills and draws attention to perhaps the most obvious reason why independent learning skills are important: if one is to continue learning throughout one's life, one needs to be able to do so without relying on a teacher.

This brings us back to Armstrong's question, 'When does education happen?'. The answer is that education is an ongoing, accumulative process, through which we make incremental steps throughout our lives. Education has no beginning or end; it's only circumscribed by the limits of our lifetimes. Learning not only lacks temporal limits; it's also not limited by consciousness: studies are increasingly showing that psychological processes such as memory consolidation take place during sleep, and that sleep facilitates problem-solving.

We learn at an incredibly fast rate from the moment we enter the world; but we tend to think that as we get older not only *do* we learn less, but we *should* learn less. While the descriptive claim may be true, the normative claim is not. Education never ends. But for it to never end, we need the skills to educate ourselves. That requires independent learning skills, which are important to teach students to increasing degrees throughout school and university education, such that when they leave formal education, they are equipped to continue educating themselves.

This benefit of independent learning skills not only concerns the length of time one can spend educating oneself, but also the breadth of subjects in which one can educate oneself. There are many fields in which one will not have the chance to receive a formal education. Even if one has the opportunity, one might not take full advantage of it, for reasons within or outside one's control. Equipped with independent learning skills, one can take up or re-engage with those subjects they never had the opportunity to study or didn't take full advantage of.

Developing independent learning skills is a gradual process which takes place over many years. This is why it is sometimes difficult for students and teachers to manage the transition between key stages four and five, or for students to adjust to university life – for the process of developing independent learning skills often isn't fast enough to keep up with the significance of the incremental steps between these levels of education in terms of the increasing levels of independent learning required.

This caveat is important for schools to take into account when, for example, placing expectations on the amount and quality of independent learning from sixth form students as they begin this final stage of school education. One cannot simply tell students to complete a certain number of hours of 'independent learning' outside of lessons and homework and expect this to be fruitful without some guidance as to what, exactly, they should be doing during this time and how to go about it. It's likely to be more effective to provide students with instruction and guidance on effective methods of independent learning, such as collaborative group discussions, revision techniques, effective note-taking and effective methods of reading. This guidance should be reduced as students' independent learning skills increase through sixth form study.

This caveat is particularly important to take into account when students take the Extended Project Qualification ('EPQ'), which is mostly completed via independent learning. The EPQ has become a fast-growing option in schools, with over 40,000 entries in 2019. A student taking the EPQ needs to engage in extensive independent learning but at this stage of education will typically only be early in

the stages of developing independent learning skills. It can be more fruitful for their engagement with the EPQ and the development of their independent learning skills to, for example, timetable, where possible, focused EPQ study sessions, with students working independently but a teacher being present to offer guidance if required. It's also best to offer training in research skills both early in and during the process of the EPQ, on areas such as how to identify reliable sources of research, how much research is required to support an excellent research project, and how to reference sources.

While the focus of the EPQ is on students learning for themselves and managing their learning independently, greater support needs to be provided for students at this stage of education than, for example, the support undergraduates are typically given when completing final-year dissertations. In both the EPQ and an undergraduate dissertation, though, students need to take control of the learning process, an important part of which is enabling supervisors to monitor their progress easily.

An excellent model for the level of EPQ guidance appropriate to the level of independent learning skills students have typically acquired by this point in education is offered by Cranleigh School. Students taking the EPQ at Cranleigh have three timetabled lessons per week on the EPQ, at least one of which involves seeing their supervisor. Some lessons offer guidance on research skills; students are also asked to discuss their project ideas and their supervisor provides tutorial-style support. Students have access to scaffolding by means of access to exemplar projects and supporting materials on Google Classroom, such as videos (some of which are publicly available online).

None of the above should be interpreted as claiming that the best learning process is to be *entirely* self-taught. We need not aim towards total auto didacticism in our efforts to develop independent learning skills. The path towards gaining expertise in any field is having an excellent teacher throughout one's learning process, as increasing research is showing. Just as top athletes receive coaching throughout their careers, so should those aiming to reach the top of their game in *any* field, throughout their careers. Many of the top businesspeople in the world receive professional coaching; coaching has become an area of development in education in some schools; and in recent years, there has been a steady rise of successful 'life coaches', offering professional guidance on the broadest possible field in which one could ever receive any kind of teaching or coaching, 'life'. The best learner is one with excellent skills in independent learning; and the best education consists of expert teaching. Combine those, and you have two essential ingredients to excellent education: well-developed independent learning skills combined with expert training.

How is independent learning viewed by teachers?

'Independent Learning' is often linked with other approaches to learning such as 'personalisation', 'student-centred learning' and 'ownership' of learning. Discussion of independent learning frequently arises in the context of important issues such as student-teacher roles and relationships, and the role of information and communications technology (ICT) in learning.

The aim of this literature review was to identify reliable, robust and relevant research to provide a detailed picture of independent learning and its possible impact on students. The review found a number of different terms to describe independent learning, the most common reflecting the idea of 'self-regulated learning'. The review highlighted some evidence of benefits to students particularly in the form of improved motivation and better management of their learning. The authors of the review emphasised that independent learning does not merely involve students working alone and stressed the important role teachers can play in enabling and supporting independent learning.

The review suggested that successful independent learning depends on a number of external and internal factors. External factors involve the creation of a strong relationship between teachers and students and the establishment of an 'enabling environment' in which ICT can be an important element. Internal factors are the skills that individual students have to acquire. These include cognitive skills such as focusing of memory and attention and problem-solving, metacognitive skills associated with an understanding of how learning occurs, and affective skills related to feelings and emotions.

What were the benefits of independent learning for students?

The review found some evidence of the benefits of independent learning, including:

- improved academic performance;
- increased motivation and confidence;
- greater student awareness of their limitations and their ability to manage them;
- enabling teachers to provide differentiated tasks for students; and
- fostering social inclusion by countering alienation.

What were the key elements of independent learning?

The review authors suggested that the key ingredient in independent learning was the shift of responsibility for the learning process from the teacher to the student. This involved students acquiring an understanding of their learning, being motivated to learn and collaborating with teachers to structure their learning environment. They found a consensus in the literature that independent learning did not merely involve students working alone; teachers have a key part to play in enabling and supporting independent learning though, for example, structuring group work.

Whilst offering a number of models for self-learning the review authors conceptualised independent learning in terms of processes of self-regulation. These were organised around four or more phases for students to complete including: planning, self-monitoring, controlling the pace and direction of the work and evaluation. Evaluation included students' feelings of pleasure or otherwise. Self-motivation was also identified as necessary for successful independent learning.

'External' elements which supported independent learning included the development of a strong relationship between teachers and students, and the establishment of an 'enabling environment'. Research in the review described an 'enabling environment' as one which included an appropriate 'physical environment', a flexible approach to time that teachers gave students to work on specific tasks and a shared willingness to undertake independent learning on the part of students. Appropriate resources were also necessary and it was important that teachers were knowledgeable about the work being done.

An essential element of independent learning identified in the review was positive relationships between teachers and students, based on trust. A mutual responsibility for learning, which drew in students' experiences in their family and local community, was also necessary. The skills which the review found to be necessary for successful engagement in independent learning are covered in the next section.

What skills did students need?

The review identified a number of skills that students needed to acquire in order to engage successfully in independent learning:

- Cognitive skills: such as being able to construct informal rules for solving problems; classify objects according to given criteria; form hypotheses; and reason logically. The review authors suggested that these skills were important for creating 'learner readiness'. Early years study cited in the review concluded that by the age of seven, with the right assistance, students are generally able to hold an internal dialogue using 'thinking language'.
- Metacognitive skills: the review found evidence that Year 6 students were able to describe *how* they learn, and to identify key activities essential for learning such as listening, remembering, applying previously learnt knowledge and using formal strategies. One group of students specifically referred to the 'look, cover, write, check' strategy. Other studies highlighted the

importance of students being able to reflect on what they had done, monitor their progress and use self-assessment in order to take responsibility for their own learning.

- **Affective skills:** these skills are related to managing feelings. Studies in the review identified motivation as the most important affective attribute in relation to independent learning. One study suggested that another important affective skill, which is related to motivation, is 'delay of gratification'. This refers to the ability to wait for achievement outcomes.

How did teachers promote independent learning?

The review stressed the key role of teachers in assisting students to become independent learners by ensuring that students were actively involved in learning. The research found a number of strategies that supported students' independent learning including:

1. **scaffolding:** this refers to the supportive structure provided by skilled others, in this case teachers, which aids students in their learning. The objective is the gradual transfer of responsibility from the teacher to the student step by step, the teacher responding flexibly to students' responses rather than following a predetermined teaching path;
2. **providing students with opportunities to self-monitor:** the review suggested self-monitoring depends on the two processes of establishing goals and receiving feedback from others and from oneself. Teachers encouraged students to self-monitor by helping them use internal and external feedback to see whether the strategies they were using were effective for achieving learning goals.
3. **offering models of behaviour:** independent learning was promoted by encouraging students to model the behaviour of their teachers, including, for example, teachers showing students how categorising information made it easier to remember;
4. **developing communication that included language focused on learning:** this helped students become more aware of the steps involved in learning, understand their own learning styles and helped students and teachers share their thinking;
5. **providing feedback on homework:** this was found to improve students' confidence in working independently and to help them develop the reflective aspect of independent learning.

Metacognition: thinking about thinking

Metacognition is the name given to the ability to be aware of, think about, and manage one's own thinking processes. Metacognition was introduced as a subsidiary theme for the ASCEND project, as it was considered that gifted (<https://science-education-research.com/glossary/gifted/>) learners would need well-developed metacognitive skills to work optimally.

Metacognition can include rather basic levels of thinking about thinking: 'that was hard', 'I should be able to do this, it's primary school work', 'I wasn't really concentrating on my work just then'.

However, metacognition would also include a more sophisticated awareness of one's cognitive strengths and weaknesses, allowing decisions to be made about what tasks can likely be achieved, how long a piece of work might take, when help is likely to be needed.

Metacognitive skills would include the types of abilities involved in solving non-trivial problems, being able to break down problems in simpler steps, monitoring progress, recognising where errors might be made, and incorporating suitable checks, etc.

Self-regulated learners

Independence in learning, or the ability of a learner to be 'self-regulated' is clearly a goal for all our students: we want them to leave school with life-skills that make them effective learners, who know how to research topics for themselves.

Developing 'thinking skills' is seen as being central to the school curriculum (<https://science-education-research.com/glossary/curriculum/>), and science clearly has a major role to play in this agenda. Thinking skills include logical thought, creativity, etc., but also metacognitive skills.

Some schools already support students in developing metacognition (<https://science-education-research.com/glossary/metacognition/>) through teaching about study skills: explaining about 'active' learning, effective revision technique, learning styles (<https://science-education-research.com/glossary/learning-style/>), and so on. Basic knowledge of how perception, attention and memory work, can help learners understand their own cognitive processes.

Metacognition Awareness

Flavell (1979) defined the concept of metacognition as an awareness of how one learns and having knowledge of how to use information in achieving a goal. In general, metacognitive awareness plays an important role in planning the learning process, evaluating the process, and conducting adequate self-assessment (Akben, 2020). Those with a strong level of higher cognitive awareness will have higher levels of learning achievement (Zhang et al., 2019) self-directed learning skills (Karatas, 2017). One of the benefits of this age for people is the spread of online learning environments beyond a specific and limited learning environment. Metacognitive awareness is an important component for online learning (Rapchak, 2018). Metacognition is especially consequential for online learners because completing online courses requires the ability to regulate one's own learning and to stay motivated to end coursework (Lee et al., 2013). At that point, it is stated that students' metacognitive awareness improves when learning environments are supported with digital tools (Raes et al., 2012; Reisoglu et al., 2020).

Tutkun et al. (2012) agreed with the idea that the intersection empowers teachers and educators to identify which knowledge they expect students to determine and choose, and which cognitive process dimension is used. A learner can remember factual knowledge and procedural knowledge, understand conceptual knowledge, analyze metacognitive knowledge, and/or evaluate metacognitive knowledge. According to Anderson & Krathwohl (2001), meaningful learning provides learners with the knowledge and cognitive processes they need for successful problem solving.

This intersection brings benefits to teachers in designing learning activities for their students. In line with Anderson & Krathwohl's ideas, Tutkun et al. (2012) say that this intersection enables teachers to identify which knowledge they expect their students to master and to establish the dimensions of cognitive processes developed in students. A student may be facilitated to recall factual or procedural knowledge, to understand conceptual or metacognitive knowledge, or perhaps to analyze factual or metacognitive knowledge. The ideas of Anderson & Krathwohl (2001) are supported by Dettmer (2006) and Wu et al. (2016). It is well founded that Anderson & Krathwohl (2001) link this cognitive taxonomy to the types of learning and assessment (Dettmer, 2006).

According to Wu et al. (2016), the intersection of process ability and cognitive products of the students will stimulate the forms of student learning activities and the kinds of relevant assessments that teachers can choose.

Nitko & Brookhart (2011) also support the principles applied in the revised Bloom's taxonomy. The number of intersections of the levels of cognitive processes and knowledge will create a wide range of learning and assessment activities. Thus, the revised Bloom's taxonomy will provide additional types of abilities/behaviors that should be established in lesson planning. According to Nitko & Brookhart (2011), the use of this taxonomy can help students improve their understanding of the importance of an ability (behavior) assigned in the lesson plan. Teachers should use this taxonomy to set learning goals, which will make it easier to set learning experiences and prepare relevant assessment instruments (Dettmer, 2006; Haolader et al, 2015). So far, neither the information about the mastery of the cognitive process and knowledge of high school students, especially in biology subject, nor the information about high school students' thinking skills in remembering, understanding, up to creating in Curriculum 2006 and Curriculum 2013, are available. The students'

mastery level of factual knowledge, conceptual knowledge, up to the metacognitive knowledge, in relation to the curriculum used is still unknown.

As we come to the review of literature, it documented the importance of metacognitive skills in learning process. Flavell [1] suggests that a good student is someone who has a strong knowledge base that includes metacognitive knowledge, the cognitive task to be solved and the strategies to achieve goals. Students who are able to plan, monitor and evaluate their learning process is said to have good metacognitive skills. Metacognitive allow students to select and invent strategies explicitly, by thinking about their understanding of the task demands, their available cognitive resources, and their own experience of solving similar problems [2]. Schraw and Graham [3] asserted that metacognition is an important component for effective learning because it enables individuals to plan, monitor and regulate their cognitive performance.

Despite the importance of metacognitive skills in the learning process, the development of metacognitive skills is not being emphasized in many classrooms today [4] [5]. Most teachers focus on content and ignore the learning process used while learning the content. In other words, students are assumed that they can learn on their own the necessary skills needed to learn effectively.

According to McGilly [6], most students do not engage in meaningful learning and most of the students used rote learning as a main strategy. He claimed that the

students should be provided with the necessary skills such as learning skills, social skills, problem solving skills and information organizations skills that should be

taught and integrated across the curriculum. In this regard, the role of teachers is very important in helping students to improve their metacognitive skills.

Metacognitive approach is identified as one method that can be used to develop students' study skills and strategies. Metacognitive approach refers to an approach which emphasizes the development of skills that help students plan, monitor and evaluate their own learning process. One important feature of this approach is the emphasis on the learning process in teaching and learning in the classroom. Emphasis on the learning process refers to activities that makes the learning process explicit and visible to students. The question is to what extent do teachers foster metacognitive development in the classroom. White [13] states that teachers can enhance students' metacognitive skills by giving directions and explaining to students how to think about what the students do. The teacher should have a desire to direct the students to think about how they learn and the problems they face in the learning process. Besides, teachers also should help students identify how they can improve their learning and become better students. Scientist Thomas claims that metacognitive development can be developed when students learn the educational content. In other words, learning skills can be developed in the process of teaching and learning in the classroom. He suggested seven aspects in teaching and learning activities that can be used to foster students' metacognitive development.

Metacognitive development activities in this study refer to the seven aspects/activities as proposed by Thomas, namely:

- a) Metacognitive reflection: Reflecting on metacognition indicates a conscious effort of teachers to guide students to think about how they learn. For example, the teacher asked the students how they learn, how they solve the task and the difficulties faced by students while studying. Teachers also asked students to try to learn a method or technique.
- b) Student-student discourse: Interaction among students include how they talk about a variety of learning styles. For example, students discuss how they learn, and the different ways to learn and how to improve the way they learn.
- c) Student-teacher discourse: Interaction between teachers and students focusing on how they can improve their learning.

- d) Student voice: The views of students referred to the opportunities created so that students realize the need to ask teachers about why they need to do certain activities in the classroom. Students also can suggest other learning activities and can voice their opinions about factors that hinder their learning.
- e) Distributed control: Distributed control referred to the efforts of teachers and students to collaborate or work together to plan the study so that they can grow as independent students. For example, students are given the authority by the teacher to plan what needed to be studied, to determine the activity to be done, and the time required to perform these activities.
- f) Teacher encouragement and support: Teacher encouragement and support refer to efforts to improve students' learning processes. For example, teachers motivate students to try to improve how they learn, looking for and evaluate different ways of learning. The teacher also supports effort to understand and learn new methods of learning, and motivate them to discuss how they learn.
- g) Emotional support: emotional support refers to support given by teachers to students. For example, in the classroom teachers treat students fairly, appreciated the efforts of students, respect the ideas of students, respect for individual differences and also to promote trust between teachers and students.

Based on this framework, the study sought to identify the extent teachers carrying out activities to enhance student's metacognitive skills in the classroom as measured by the seven aspects of activities to promote metacognition in the classroom suggested by Thomas. The concept of metacognitive skills defined by O'Neil and Abedi was used to measure metacognitive skills in this study. Metacognitive skills comprise three components of planning, monitoring and evaluation. Planning is a learning plan, setting goals, prioritizing materials instead of learning itself. Monitoring is the monitoring of learning and strategies used in self-analysis and assessment of the effectiveness of the implementation of the strategy.

In conclusion, teachers are still not paying enough attention to the development of student's metacognitive skills. Therefore, efforts should be taken to increase the teachers' awareness on the importance of promoting metacognitive development in the classroom and the effective ways to promote them in the classroom. In other words, it is important to gather effort to help students develop their metacognitive skills.

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